

New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

CE501- Fluid Mechanics-I

Unit-I

Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, specific volume, specific gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and Tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit-II

Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non uniform, one, two and three dimensional flow, path lines, streamlines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets- their utility & method of drawing flow nets.

Unit-III

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications. Fluid Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.); flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturimeter, weirs and notches).

Unit-IV

Laminar Flow: Introduction to laminar flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law.

Unit-V

Dimensional Analysis and use of Buckingham-pi theorem, Introduction to Turbulent flow-Prandtl mixing length hypothesis, Flow over smooth & rough surface. Darcy –Weisbach resistance equation , variation of friction factor & Moody's diagram , pipe flow problem.

Reference Books : -

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechanics and machinery; TMH
3. Engg fluid mech. – By Grade & Miraj gaonkar , Nem Chand & Bros. Prakashan
4. White ; Fluid Mechanics ; TMH
5. Essential of Engg Hyd. By JNIK DAKE; Afrikan Network & Sc Instt. (ANSTI)
6. A Text Book of fluid Mech. for Engg. Student by Franiss JRD
7. R Mohanty; Fluid Mechanics By; PHI
8. Fluid Mechanics; Gupta Pearson.

List of Experiment (Expandable):

1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Venturimeter
4. Determination of C_c , C_v , C_d of Orifices
5. Calibration of Orifice Meter
6. Calibration of Nozzle meter and Mouth Piece
7. Reynolds experiment for demonstration of stream lines & turbulent flow
8. Determination of metacentric height
9. Determination of Friction Factor of a pipe
10. To study the characteristics of a centrifugal pump.
11. Verification of Impulse momentum principle

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Civil Engineering, V-Semester

CE502 - Transportation Engineering- II

Unit - I

High way planning, Alignment & Geometric Design: Principles of highway planning, road planning in India and financing of roads, classification patterns. Requirements, Engg. Surveys for highway location.

Cross sectional elements- width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves, numerical problems.

Unit – II

Bituminous & Cement Concrete Payments: Design of flexible pavements, design of mixes and stability, WBM, WMM, BM, IBM, surface dressing, interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction and maintenance. Advantages and disadvantages of rigid pavements, general principles of design, types, construction, maintenance and joints, dowel bars, tie bars. Brief study of recent developments in cements concrete pavement design, fatigue and reliability.

Unit – III

Low Cost Roads, Drainage of Roads, Traffic Engg. & Transportation Planning: Principles of stabilization, mechanical stabilization, requirements, advantages, disadvantages and uses, quality control, macadam roads-types, specifications, construction, maintenance and causes of failures.

Surface and sub-surface drainage, highway materials: properties and testing etc. Channelised and unchannelised intersections, at grade & grade separated intersections, description, rotary-design elements, advantages and disadvantages, marking, signs and signals, street lighting. Principles of planning, inventories, trip generation, trip distribution, model split, traffic assignment, plan preparation.

Unit - IV

Airport Planning, Runway & Taxiway: Airport site selection. air craft characteristic and their effects on runway alignments, windrose diagrams, basic runway length and corrections, classification of airports.

Geometrical elements: taxi ways and runways, pattern of runway capacity.

Unit - V

Airport, Obstructions, Lightning & Traffic control: Zoning regulations, approach area, approach surface-imaginary, conical, and horizontal. Rotating beacon, boundary lights, approach

lights, runway and taxiway lighting etc. instrumental landing system, precision approach radar, VOR enroute traffic control.

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

Reference Books:

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 Manual by Dr. S.K. Khanna
12. Highway Engg. By Hews & Oglesby
13. Highway Material by Walker

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

Departmental Elective CE- 503 (A) Structural analysis-II

Unit. I

Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

Unit. II

Plastic analysis of beams and frames.

Unit. III

Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

Unit. IV

Matrix method of structural analysis: force method and displacement method.

Unit. V

Influence lines for intermediate structures, Muller Breslau principle.

Reference Books :-

1. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
2. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
3. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
4. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo.
5. Weaver W & Gere JM, Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi

New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

Departmental Elective CE- 503 (B) Construction Planning & Management

Unit -I

Preliminary and detailed investigation methods: Methods of construction, form work and centering. Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

Unit -II

Construction equipments: Factors affecting selection, investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

Unit -III

Contracts: Different types of controls, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

Unit -IV

Specifications & Public Works Accounts: Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill.

Unit-V

Site Organization & Systems Approach to Planning: Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering. Problem of equipment management, assignment model, transportation model and waiting line models with their applications, shovel truck performance with waiting line method.

Reference Books:-

1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

Departmental Elective CE- 503 (C) Quantity surveying & Costing

Unit – I

Introduction: Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

Unit – II

Rate Analysis: Task for average artisan, various factors involved in the rate of an item, material and labour requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.)

Unit – III

Detailed Estimates: Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as water supply, drainage and electrification.

Unit – IV

Cost of Works: Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building. Preparation of DPR.

Unit – V

Valuation: Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.

Reference Books:-

1. Quantity Surveying & Costing – B.N. Datta
2. Estimating & Costing for Civil Engg. – G.S. Birdi
3. Quantity surveying & costing – Chakraborty
4. Estimating & Costing – S.C. Rangawala

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

Departmental Elective CE- 503 (D) Marine Construction

Unit – I

History of water transportation at world level and at national level development and policy, classification of harbours, natural and artificial. Major ports in India, administrative set up. 2.

Unit – II

Harbour Planning: Harbour components, ship characteristics, characteristics of good harbour and principles of harbour planning, size of harbour, site selection criteria and layout of harbours. Surveys to be carried out for harbor planning

Unit – III

Natural Phenomena: Wind, waves, tides formation and currents phenomena, their generation characteristics and effects on marine structures, silting, erosion and littoral drift.

Unit – IV

Marine Structures: General design aspects, breakwaters -function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories – function, types, suitability, design and construction features.

Unit – V

Docks and Locks: Tidal basin, wet docks-purpose, design consideration, operation of lock gates and passage, repair docks -graving docks, floating docks.

References books: –

1. A course in docks and harbours: S. P. BINDRA
2. Harbour docks and tunneling: R. SRINIVASAN
3. Doc and harbour engineering: OZA

New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

Open Elective CE- 504 (A) Urban & Town Planning

UNIT-I

Definition and classification of urban areas - Trend of urbanization - Planning process - Various stages of the planning process - Surveys in planning. Plans - Delineation of planning areas. utility of spaces, future growth etc. Role of “Urban Planner ”in planning and designing in relation with spatial organization, utility, demand of the area and supply

UNIT-II

Plan implementation- Urban Planning agencies and their functions - Financing- Public, private, Nongovernmental organizations- Public participation in Planning. Development control regulations. sustainability and rationality in planning, Components of sustainable urban and regional development, Emerging Concepts: Global City, inclusive city, Safe city, etc. City of the future, future of the city.

UNIT-III

Town and country planning act- Building bye-laws. Elements of City Planning, Zoning and land use, Housing. Introduction to landscaping, importance , objectives, principles, elements, Urban Planning standards Urban renewal for quality of life and livability.

UNIT-IV

Traffic transportation systems: urban road, hierarchy, traffic management, Intelligent Transport Systems. Legal Issues in Planning and Professional Practice, Concepts and contents related to planning provision regarding property rights, Concept of Arbitration, State and Central government to deal with various matters concerning Town and Country Planning. mechanism for preparation of DP: Land Acquisition Rehabilitation and Resettlement Act 2013.

UNIT-V

Types of Development plans: Master Plan, City Development Plan, Structure Plan ,housing, land use, Water Supply & sanitation, etc., Planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, MMRDA/ PMRDA etc).

Reference Books:-

- 1.Adib Kanafani.(1983). Transportation Demand Analysis. Mc Graw Hill Series in Transportation, Berkeley.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, New York.

3. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.
4. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.
5. Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.
6. Yoder and Witczak, Principles of Pavement Design, John Wiley and Sons
7. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.
8. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)
9. W.Ronald Hudson, Ralph Haas and Zeniswki , Modern Pavement Management, Mc Graw Hill and Co Academic Session 2016-17
10. Relevant IRC Codes
11. Bruton M J (1981), “Introduction to transportation planning”, Hutchinson of London
12. Dickey J W(1980), “Metropolitan Transportation Planning”, Tata McGraw Hill
13. Principles of Transportation Engineering : P. Chakraborty and A. Das
14. Fundamentals of Transportation Engineering: : C.S. Papacoastas
15. Traffic Engineering and Transport Planning: : L.R. Kadyal

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

Open Elective CE- 504 (B) Remote Sensing & GIS

UNIT-I

Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements of visual interpretation techniques.

UNIT-II

Remote Sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms- IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions (spatial, spectral, radiometric and temporal). Basics of digital image processing- introduction to digital data, systematic errors(Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity , Earth Rotation) and non-systematic [random] errors(Altitude, Attitude), Image enhancements(Gray Level Thresholding, level slicing, contrast stretching),image filtering.

UNIT-III

Geographic Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data, GIS Operations: Spatial Data Input – Attribute data Management, Geographic coordinate System, Datum; Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones

UNIT-IV

Data Models: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database, Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion.

UNIT-V

Integrated Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services And Its Applications.

Reference Books:-

- 1.Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
- 2.Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
- 3.Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

4. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yongg, Prentice Hall (India) Publications.
5. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
6. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

Open Elective CE- 504 (C) Renewable Energy Sources

Unit - I

Renewable Energy Systems Energy Sources, Comparison of Conventional and nonconventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning, Energy efficiency and management.

Unit – II

Wind Energy System Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. Grid independent systems - wind-battery, wind- diesel, wind-hydro biomass etc. wind operated pumps, controller for energy balance. Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition. Synchronous versus Induction Generator for stand alone systems. Use of electronic load controllers and self excited induction generators. Wave Energy System: System configuration: grid connected and hybrid Systems.

Unit - III

Solar Radiation Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Phototonic System Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels. Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Unit - IV

Energy from oceans Ocean temperature difference, Principles of OTEC, plant operations, Geothermal Energy Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern nonconventional energy sources.

Unit - V

Electric Energy Conservation Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, airconditioning, power plants, process industries, illumination etc. Methods of Energy Audit. Measurements systems; efficiency

measurements. energy regulation, typical case studies, various measuring devices analog and digital, use of thyristers.

Reference Books:-

1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wakil, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.
4. F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York USA
5. Anna Mani, "Wind Energy Resource Survey in India-III", Allied Publishers Ltd., New Delhi,
6. S.P. Sukhatme: Solar Energy, TMH- 4e,
7. Dr. A. Ramachandran, Prof B.V Sreekantan & M F.C. Kohli etc, "TERI Energy Data Directory & Year book 1994-95", Teri Tata Energy Research Institute, New Delhi,
8. Solanki –Renewable Energy Technologies – PHI Learning
9. Sawhnew –Non Conventional Energy Resources – PHI Learning

Open Elective CE- 504 (D) Entrepreneurship Development & Management

UNIT I

Entrepreneurship Entrepreneur Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II

Motivation Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III

Business Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV

Financing And Accounting Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V

Support To Entrepreneurs Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Reference Books:-

- 1.Khanka. S.S., “Entrepreneurial Development” S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
- 2.Donald F Kuratko, “ Entrepreneurship – Theory, Process and Practice”, 9th Edition, Cengage Learning 2014.
- 3.Hisrich R D, Peters M P, “Entrepreneurship” 8th Edition, Tata McGraw-Hill, 2013.
- 4.Mathew J Manimala, “Entrepreneurship theory at cross roads: paradigms and praxis” 2nd Edition Dream tech, 2005.
- 5.Rajeev Roy, ‘Entrepreneurship’ 2nd Edition, Oxford University Press, 2011.
- 6.EDII “Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development”, Institute of India, Ahmadabad, 1986

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, V-Semester

CE505- Quantity Surveying & Costing (Lab)

List of Experiments:

- 1.. Preparation of detailed estimate.
2. Detailed estimate for services of plumbing and water supply or Electrification work.
3. Detailed estimate for earth work for the road construction or arched culvert.
4. Rate analysis for at least 8 items of construction.
5. Preparation of DPR of Civil Engineering Project.

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Civil Engineering, V-Semester

CE506- Material Testing Lab

List of Experiments:

1. To determine the normal consistency of cement.
2. To determine the initial and final setting time of cement .
3. To determine compressive strength of cement.
4. To determine the soundness of cement.
5. To determine the fineness modulus of fine aggregate & course aggregate.
6. Mix design of concrete by IS code Method.
7. Slump test for determining workability of concrete.
8. Compressing strength of concrete cube.
9. To determine the flexure strength of concrete.

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VI-Semester

CE601- Structural Design & Drawing (RCC-I)

Structural Design & Drawing (RCC-I)

Unit - I

Basic Principles of Structural Design: Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design of singly reinforced beam, Partial load factors.

Unit - II

Design of Beams: Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and bond.

Unit-III

Design of Slabs: Slabs spanning in one direction. Cantilever, Simply supported and Continuous slabs, Slabs spanning in two directions, Circular slabs, Waffle slabs, Flat slabs, Yield line theory.

Unit -IV

Columns & Footings: Effective length of columns, Short and long columns- Square, Rectangular and Circular columns, Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

Unit -V

Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slabless tread-riser staircase.

NOTE :- All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids)

Laboratory Work: Laboratory work will be based on the above course as required for engineering projects.

Reference Books: -

1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH

5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju.

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VI-Semester

CE602- Environmental Engineering-I

Environmental Engineering-I

Unit – I

Estimation of ground and surface water resources. quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population.

Unit – II

Impurities of water and their significance, water-borne diseases, physical, chemical and bacteriological analysis of water, water standards for different uses. Intake structure, conveyance of water, pipe materials, pumps - operation & pumping stations.

Unit – III

Water Treatment methods-theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

Unit – IV

Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.

Unit – V

Characteristics and analysis of waste water, recycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Th OD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.

Reference Books: -

1. Water Supply Engineering by B.C. Punmia - Laxmi Publications (P) Ltd. New Delhi
2. Water Supply & Sanitary Engg. by G.S. Birdi - Laxmi Publications (P) Ltd. New Delhi
3. Water & Waste Water Technology by Mark J.Hammer - Prentice - Hall of India, New Delhi
4. Environmental Engineering - H.S. Peavy & D.R.Rowe-Mc Graw Hill Book Company,New Delhi
5. Water Supply & Sanitary Engg. by S.K. Husain
6. Water & Waste Water Technology - G.M. Fair & J.C. Geyer
7. Relevant IS

List of Experiments:

1. To study the various standards for water
2. To study of sampling techniques for water
3. Measurement of turbidity
4. To determine the coagulant dose required to treat the given turbid water sample
5. To determine the conc. of chlorides in a given water samples
6. Determination of hardness of the given sample
7. Determination of residual chlorine by “Chloroscope”
8. Determination of Alkalinity in a water samples
9. Determination of Acidity in a water samples
10. Determination of Dissolved Oxygen (DO) in the water sample.

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VI-Semester

Departmental Elective CE 603(A) Water Resource Engineering

Unit - I

Irrigation water requirement and Soil-Water-Crop relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

Unit - II

Ground Water and Well irrigation:

Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge-necessity and methods of improving ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence causes and effects. Reclamation of water logged and salt affected lands. Types of wells, well construction, yield tests, specific capacity and specific yield, advantages and disadvantages of well irrigation.

Unit-III

Hydrology: Hydrological cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph.

Unit - IV

Canals and Structures: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lining-objectives, materials used, economics. Introductions to Hydraulic Structures viz.Dams,Spillways,Weirs ,Barrages,Canal Regulation Structures.

Unit-V

Floods: Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control.

Reference Books: -

1. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
2. Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
3. Engg. Hydrology - J.NEMEC - Prentice Hall
4. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
5. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
6. Engg. Hydrology by H.M. Raghunath

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VI-Semester

Departmental Elective CE 603(B) Precast & Modular Construction

Precast & Modular Construction

Unit – I

Introduction-Need for prefabrication – Principles – Materials – Modular coordination – Standardization –Systems – Production – Transportation – Erection.

Unit – II

Prefabricated components-Behavior of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

Unit – III

DESIGN PRINCIPLES Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

Unit – IV

Joints in Structural Members-Joints for different structural connections – Dimensions and detailing – Design of expansion joints

Unit – V

Design of abnormal load: Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse.

Reference Books: -

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., “Knowledge based process planning for construction and manufacturing”, Academic Press Inc., 1994

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VI-Semester

Departmental Elective CE 603(C) Advance Pavement Design

Advance Pavement Design

Unit -I

Equivalent Single Wheels Load concepts and applications, Relationship between wheel arrangements and loading effects, tyre contact area, Effect of load repetition, Effect of transient loads, Impact of moving loading, Factors to be considered in Design of pavements, Design wheel load, soil, climatic factors, pavement component materials, Environmental factors, Special factors such as frost, Freezing and thawing.

Unit -II

Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory , Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

Unit -III

Rigid Pavements: Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

Unit -IV

Rigid pavement design: IRC method, Fatigue analysis, PCA chart method. AASHTO Method, Reliability analysis. PAVEMENT JOINTS: Types of joints, contraction and warping joints, dowel bars and tie bars, Temperature reinforcements, filling and sealing of joints.

Unit -V

Evaluation and Strengthening of Existing Pavements: Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

Reference Books:--

1. Principles of pavement design by E.J.Yoder & M.W. Witzak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidelines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VI-Semester

Departmental Elective CE 603(D) Cost Effective & ECO-Friendly Structures

Cost Effective & ECO-Friendly Structures

Unit -I

Concepts of energy efficient & environment friendly materials and techniques. 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

Green Building rating systems

Reference books:-

1. Alternative Building Materials and Technologies – K S Jagadeesh, B V Venkatta Rama Reddy & K S NanjundaRao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – AskoSarja –CRC Press
3. Non-conventional Energy Resources –D S Chauhan and S K Sreevasthava – New Age International Publishers
4. Buildings How to Reduce Cost – Laurie Backer - Cost Ford
5. Lynne Elizabeth, Cassandra Adams Alternative Construction : Contemporary Natural BuildingMethods ”, Softcover, Wiley & Sons Australia, Limited, John,2005
6. Givoni, “Man, Climate, Architecture, Van Nostrand, New York, 1976.
7. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery,John Wiley & Sons,2005.
8. Eugene Eccli- Low Cost, Energy efficient shelter for owner & builder, Rodale Press, 1976

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VI-Semester

Open Elective CE 604(A) Fluid Mech. – II

Fluid Mech. – II

Unit-I

Turbulent flow : Laminar and turbulent boundary layers and laminar sublayer, hydrodynamically smooth and rough boundaries, velocity distribution in turbulent flow, resistance of smooth and artificially roughened pipes, commercial pipes, aging of pipes. Pipe flow problems : Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes. Pipe Network : *Water Hammer (only quick closure case). transmission of power. *Hardy Cross Method

Unit-II

Uniform flow in open channels : Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections, Saint Venet equation.

Unit-III

Non uniform flow in open channels : Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.

Unit-IV

Forces on immersed bodies: Types of drag, drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, magnus effect.

Unit-V

Fluid Machines: Turbines : Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation. Pumps: Centrifugal pumps : Various types and their

important components, manometric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working and characteristic curves.

Reciprocating pumps: Principle of working, Coefficient of discharge, slip, single acting and double acting pump, Manometric head, Acceleration head.

Reference books:-

1. Fluid Mechanics - Modi & Seth - Standard Book house, Delhi
2. Open Channel Flow by Rangaraju - Tata Mc Graw - Hill Publishing Comp. Ltd., New Delhi
3. Fluid Mechanics - A.K. Jain - Khanna Publishers, Delhi
4. Fluid Mechanics, Hydraulics & Hydraulic Machanics - K.R. Arora - Standard Publishers Distributors 1705- B, Nai Sarak, Delhi-6
5. Hyd. of open channels By Bakhmetiff B.A. (McGraw Hill, New York)
6. Open Channel Hyd. By Chow V.T. (McGraw Hill, New York)
7. Engineering Hydraulics By H. Rouse
8. Centrifugal & Axial Flow Pump By Stempanoff A.J. New York
9. Relevant IS codes.

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New Scheme Based On AICTE Flexible Curricula

Civil Engineering, VI-Semester

Open Elective CE 604(B) Intellectual Property Rights

Course Objective

Acquaint the students with the basic concepts of Intellectual Property Rights; and sensitize the students with the emerging issues in IPR and the rationale for the protection of IPR.

UNIT I Introduction

Introduction and Justifications of IPR, Nature of IP, Major forms of IP- *Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property.*

Major international documents relating to the protection of IP - *Berne Convention, Paris Convention, TRIPS.* The World Intellectual Property Organization (WIPO).

UNIT II Copyright

Meaning and historical development of copyright , Subject matter , Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and licence of rights, Infringement of copyright, Exceptions of infringement, Remedies, *Civil, Criminal, Administrative*, Registration Procedure.

UNIT III Patents

Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory licence, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

UNIT IV – Trade Marks, Designs & GI

Trade Marks: Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board.

Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs.

Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorised user.

UNIT V Contemporary Issues & Enforcement of IPR

IPR & sustainable development, The Impact of Internet on IPR. IPR Issues in biotechnology, E-Commerce and IPR issues, Licensing and enforcing IPR, Case studies in IPR

Course Outcome:

1. Students will be able to understand Primary forms of IPR
2. Students will be able to asses and critique some basic theoretical justification for major forms of IP Protection
3. Students will be able to compare and contrast the different forms of IPR in terms of key differences and similarities.
4. Students will be able understand the registration procedures related to IPR.
5. Students will be exposed to contemporary issues and enforcement policies in IPR.

References:

1. **P. Narayanan, Intellectual Property Law, Eastern Law House**
2. . **Neeraj Pandey and Khushdeep[Dharni, Intellectual Property Rights, PHI, 2014**
3. **N.S Gopalakrishnan and T.G. Agitha, Principles of Intellectual Property, Eastern Book Co. Lucknow, 2009.**
4. **Anand Padmanabhan, Enforcement of Intellectual Property, Lexis Nexis Butterworths, Nagpur, 2012.**
5. **Managing Intellectual Property The Strategic Imperative, Vinod V. Sople, PHI.**
6. **Prabuddha Ganguli, “ Intellectual Property Rights” Mcgraw Hill Education, 2016.**

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Civil Engineering, VI-Semester

Open Elective CE 604(C) Environmental Impact Assessment

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.

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Civil Engineering, VI-Semester

Open Elective CE 604(D) Operation Research

Operation Research

Unit I

Linear Models: The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

Unit II

Transportation Models And Network Models: Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

Unit III

Inventory Models: Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

Unit IV

Queueing Models: Queueing models – Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

Unit V

Decision Models: Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variable search technique – Dynamic Programming – Simple Problem.

Reference books:-

Taha H.A., “Operations Research”, Sixth Edition, Prentice Hall of India, 2003.

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Civil Engineering, VI-Semester

CE605- Advance surveying lab

List of Experiments

1. Measurement of Distance by Chaining and Ranging.
2. Locating Various Objects by Chain or Cross-Staff Surveying.
3. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
4. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
5. Fixing bench mark with respect to temporary bench mark with dumpy level by fly levelling and check levelling.
6. Measurement of vertical angles with theodolite.
7. Determination of horizontal distance between two inaccessible points with theodolite.
8. Locating given building by theodolite traversing
9. To perform complete survey with Total Station.

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Civil Engineering, VI-Semester

CE606- Non- Destructive Testing Lab

Non- Destructive Testing Lab

List of experiment:

1. To study of Rebound Hammer Test.
2. To study of UPV Test.