## TEACHING SCHEME FOR B.TECH SEMESTER VII (CBCS), CIVIL ENGINEERING.

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## TEACHING SCHEME FOR B.TECH SEMESTER VIII (CBCS), CIVIL ENGINEERING.

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B.Tech. Sem. VII – Civil Engineering

2CI701 Design of Concrete Structure.

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COURSE CONTENT:

UNIT I  Structural layout for buildings:
General detailing required in structural drawing as per SP-34, do’s details required for general drawing, beam, slab and column as per SP-34.

UNIT II  Continuous beam, typical floor design including two way continuous slabs, T beam floor.

UNIT III  Columns:
Slender columns with uniaxial and biaxial bending, Eccentric, Biaxial

UNIT IV  Footings:
Combined footings and raft, Biaxial

UNIT V  Structure:
Canopy, cantilever shed portal, building, flat slab.

UNIT VI  Structural detailing
Reinforcement detailing of structural elements as per SP-34.

UNIT VII  Design of Water Tank:
Underground and elevated circular and rectangular water tanks retaining walls.

TERM WORK
I  Term work shall consist of not less than 3 designs suitably selected from topics of the course under design of reinforced concrete structures. The report shall consist of full analytical treatment, design procedure, references and all necessary drawings in from of neat dimensioned sketches. In addition working drawing shall be in imperial size drawing sheet.
Practical examination shall consist of oral and sketching based on topics given under the subject

REFERENCE BOOKS:
I  Limit State Theory & Design of Reinforced Concrete - Shah & Karve
III  Design of Concrete Structures - A.K. Jain
IV  Design of Concrete Structures - Dayaratnam
V  Advanced Design of Concrete Structures - Krishna Raju
VI  Code of practice for plain and reinforced concrete (III revision) with amendment 1) - IS : 456
VII  Code of practice for structural safety of Building Loading standards. (revised) (with Amendment 1) - IS : 875
VIII  Criteria for earthquake resistant design of structure (III revision) – IS : 1893
IX  Design aids for reinforced concrete IS : 456 - SP : 16
X  Reinforcement detailing - SP : 34
B.Tech. Sem. VII – Civil Engineering
2CI 702 Professional Practice and valuation.

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**Course Content:**

**UNIT I Office Practice:**
Organizational set up, working of professional firms, office procedure, construction contracts, legal aspects, professional charges, role of builder and contractor.

**UNIT II Tendering and Contracting:**
Tender and tendering process, types of tenders, contract, Principles of contracting, types, scope of contract, contract documents, condition of contract, execution of work, improper work and defects, time extension, liquidated damages, contract breach, certificates and payments, duties and liabilities, e-tendering.

**UNIT III Arbitration & Easement:**
The purpose of arbitration, the powers and duties of arbitrator, Arbitration and building contract, Types of Arbitration, Fire insurance, easement characteristics, types.

**UNIT IV Valuation:**

**UNIT V P.W.D Accounts and Procedure of works:**

**UNIT VI Entrepreneurship development:**
Concept, need and scope of entrepreneurship, characteristic of entrepreneurship, Forms of business organization.

**UNIT VII IPR and Patent Act:**
Importance and scope, forms of IPR, patents, copy rights, trademarks, relevant acts.

**Practical/Tutorial/Drawing/Sketching:**
Based on the theory course prescribed as above.
### Reference Books:

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<th>Title</th>
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<tr>
<td>III</td>
<td>Rashan Nanavati</td>
<td>“Professional Practice”</td>
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B.Tech. Sem. VII – Civil Engineering

2CI 703 Highway and Traffic Engineering.

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COURSE CONTENT:

UNIT I Highway Planning and Administration:
History of road development, Road planning in India, Highway administration.

UNIT II Highway Geometrics:
Alignment criteria and procedure, Types of highways,, Horizontal and vertical elements and design parameters, Problems of geometric design, cross sections of different roads.

UNIT III Pavement Design:
Types of pavements, Sub grade soils and properties, Pavement materials, testing of binders, road aggregate mixes, Design of flexible and rigid pavements, IRC specifications, and design problems.

UNIT IV Highway Construction:
Construction of low cost roads, WBM roads, types of bituminous surfaces, major equipments,
Construction of penetration macadam, bituminous carpet, Bituminous concrete roads, Cement concrete roads.

UNIT V Highway Maintenance:
Pavement evaluation, Surface and sub-surface drainage, Maintenance of bituminous and concrete roads,
Concepts of overlays.

UNIT VI Traffic Engineering:
Basic parameters, Traffic studies, Different traffic control devices, Signs, markings, signals, Traffic management, One way system, grade separated system, highway capacity, level of service.

UNIT VII Highway Project:
Highway project preparation, surveys and investigations, project estimates, preparing project drawing and report.

UNIT VII Highways in Specific Areas:
Highways in hilly region, desert areas, waterlogged areas, issues and specific treatments.

UNIT IX Transportation Structures:
Types of bridges, Structure and function of components of bridge, surface and subsurface investigation of bridge site s, hydraulic data, scouring loading standards, construction techniques.
TERM WORK

I Term work shall consist of tests on cement and aggregate, fresh concrete and hardened concrete. It includes destructive, partial destructive and non-destructive tests.

II Term work shall include report on topic assigned by respective lab in-charge.

III Term work shall include field visit and students will have to submit a report

IV Oral/Practical marks include viva-voce on practical performed and submitted reports.

REFERENCE BOOKS:

I Kadiyali L. R., “Principles and Practice of Highway Engineering”, Khanna Technical Publications, Delhi

II Khanna S. K. and Justo, C. E. G, “Highway Engineering”

III Different Indian Roads Congress Codes, Indian Road Congress pub., New Delhi.

IV Bridge Engg by S.P.Bindra, Dhanpat Rai and sons.
B.Tech. Sem. VII – Civil Engineering
2CI 704 Irrigation Engineering.

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**COURSE CONTENT:**

**UNIT I General:** Introduction, definition, necessity of irrigation, scope and benefits, ill effects of irrigation, irrigation development in India.

**UNIT II Methods of Irrigation:** Introduction, bandhara and lift irrigation, well and lifting devices, irrigation rates, riparian rights, principles of assessing water rates.

**UNIT III Irrigation Water:** Soil, crops and water requirements of crops. Duty and delta. Assessment of irrigation water. Methods of applying water to crops, water logging problems, causes and remedial measures.

**UNIT IV Diversion Works:** Introduction, types of diversion head work, causes of failure, Bligh’s, Lane’s and Khosla’s theories, design of glacis weir, design of vertical weir, silt control devices, Appurtenances – fish ladder, divide wall, under & scouring sluices, canal head regulator.

**UNIT V Earthen Dams:** Types of earthen dams, details, causes of failure of earth dam, seepage line, flow net, stability analysis of slopes, seepage control, safety against piping, slope protections, design considerations in earthquake region, measures of safe drainage.

**UNIT VI Gravity Dams:** Introduction, forces acting on dam, load combination for design, various stresses at any horizontal plane, middle third rule, failures of dam, stability requirements, elementary and practical profiles of dam, openings in dam, foundation treatment, spillway, capacity of spillway, components, types, factors affecting design, design criteria, energy dissipation on d/s side of spillway, stilling basins, bucket type dissipaters, spillway gates.

**UNIT VII Canals:** Alignment and types of canals, design consideration, Lacey’s & Kennedy’s theories, canal lining, canal losses and maintenance, canal regulators, falls, escapes, outlet, constructional features, CD works, Aqueducts, super passages, syphon, level crossing with principles of hydraulic design.

**TERM WORK:** NIL

**Field Visit:** Field visits based on course content are suggested

**REFERENCE BOOKS:**

I  Irrigation & Water Power Engineering - Dr. B.C.Punmia & B.B.Pande
II  Irrigation, Water Resources & Water Power Engineering - Dr. P.N.Modi
III  Irrigation, Water Power & Water Resources Engineering - Dr. K.R.Arora
IV  Irrigation and Hydraulic Structures - S.K.Garg
B.Tech. Sem. VII – Civil Engineering

2CI 705 (Civil Engineering Project - I)

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COURSE CONTENT:

UNIT I  Feasibility study, Primary and secondary data collection. Analysis & design of project covering the following broader areas. Any one of the following topics could be opted.

1. Water Supply & Sanitation Engineering -I
2. Urban Storm Water Drainage-Design & Management -I
3. Highway & Traffic Engineering -I
4. Irrigations Engineering & Hydraulic Structures –I
5. River Basin Management -I
6. Urban Planning & Management-I
7. Concrete Technology

TERM WORK

The Term-work shall comprise of the preparation of feasibility report (Hand Written), which shall include the project details, and collection of primary and secondary data, analysis & design based on the site visit made in relation to the project. The students shall present and defend their project work.

Field Visit:

Field visits based on course content are suggested.
B.Tech. Sem. VII – Civil Engineering

2CI 706 Elective Paper – I (Computational techniques in Structural Engineering)

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COURSE CONTENT:

UNIT I Stiffness method

(a) Member Approach
Overview of different stiffness & rotation-transformation matrices, analysis of beam, truss, plane frame with external load and secondary effects.
Analysis of Grid & Space structures under loading & various secondary effects like deformation of support, restraint & temperature.
Analysis of Composite structures having combination of different types members.

(b) Special topics
Symmetry/Anti-symmetry, Oblique supports, Elastic supports, Axial-flexural interaction.

UNIT II Nonlinear Analysis
Concepts of nonlinearity like Material nonlinearity, Geometry nonlinearity & Nonlinear analysis.

UNIT III Finite Element Method
Introduction to FEM, Types of problems, Stresses & Equilibrium, Strain-displacement relations, Stress-strain relations.
Application of FEM to One dimensional (bar & beam) problems & two dimensional problems using Constant strain triangles.
Two dimensional iso-parametric elements – Four noded quadrilateral elements, numerical integration, higher order elements.

UNIT IV Computer Applications
Algorithm of Stiffness method Member Approach/Finite Element method.
Different techniques for solution of equations using matrices, banded matrix, storage techniques for large size problem. Preparation of computer programs related to Curriculum using C, C++ and/or any computer programming language.
Use of any professional Structural Engineering package to analyse & design real life structural engineering problem related to curriculum.
UNIT V CAD Application

Overview of CAD & various CAD softwares, features of CAD software,
Preprocessing & Post processing, Mesh Generation,
Use of professional CAD software for detailing of Structures.

TERM WORK

I Term work shall consists of
(a)minimum 5 problems from each topics no.1, 2 & 3 & cross checking with any professional
software and/or user made program.
(b)Analysis of at least one real-life problem related to curriculum using Professional
Software.
(c) Minimum 5 CAD applications related to detailing of structure.
Practical examination shall consist of oral based on above course.

REFERENCE BOOKS:

I Gere & Weaver ; Matrix Analysis of Framed Structures
II Meghre & Deshmukh ; Matrix Analysis of Structures
III Desai & Abel; Finite Element Method
IV Bhavikatti; Finite Element Analysis
V S S Khandare; CAD Application

LEARING RESOURCES :

AutoCAD ,
Structural design – Steel & RCC
CAD lab
ESR/GSR
STAAD-Pro/STRUDS/SAP-2000/STRAP/ETABS/ANSYS
B.Tech. Sem. VII – Civil Engineering

2CI 707 Elective Paper – I (Advanced Geotechnical Engineering-I)

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**COURSE CONTENT:**

**UNIT I Overview of foundation design :**
Types of soil test & their relevance, interpretation of test data such as SPT, PLT, CPT obtained from investigation, use of geotechnical investigation report. Critical study of different bearing capacity theories, foundation on slopping ground, bearing capacity for two layered clayey soil system based on IS, Design principles & methods of raft foundation, bearing capacity of rock.

**UNIT II Deep foundation :**
Study of pile foundations in details, single piles in sand & clay, α & β method, group of piles, pile groups in cohesive and granular soils, cyclic pile load test and interpretation, pile heave and its effect on load carrying capacity and solution, uplift capacity of the pile and pile group, laterally loaded piles, better piles.
Well foundation: Components of well, force acting on well, grip length of well, design principles and stability analysis.

**UNIT III Foundations for Machines :**
Introduction to type of machines & machine foundation. Concept of natural frequency & amplitude, understanding of damping & resonance, general design criteria and requirements of machine foundation for reciprocating type, impact type, and rotary type machine as per IS. Barkan’s Method. Determination of dynamic properties of soil by CPLP & block vibration test. Vibration isolation.

**UNIT IV Introduction to reinforced earth structure and Geosynthetics** Reinforced earth mass, fundamental concept, design of REM wall, overview of geosynthetic material, properties & test methods of geotextile material, functional requirement & designing with geosynthetics: Applications of synthetics, reinforced earth retaining wall, types and design concepts of reinforcement, properties, placement of reinforcement, elements of soil anchors..

**UNIT V Applications of Software (CASTER) in Geotechnical Engineering.**

**TERM WORK**
I The term work shall consist of assignments and seminar based on case studies (minimum 30 problems & Seminar) based on the course of study under Geotechnical Engineering-II. Practical examination shall
consist of oral based on term work.

**IS CODE :**

I IS:6403 – Code of practice for determination of bearing capacity of shallow foundation

II IS:2911 (Part I to IV) – Code of practice for design and construction of pile foundation

III IS:1888 – Method of load test on soil


V IS:2974 – Code of practice for design & construction of machine foundations

**REFERENCE BOOKS:**

I Murthy V.N.S.; Soil Mechanics & Foundation Engg Vol.II

II Kaniraj S.R.; Design Aids on Soil Mechanics & Foundation Engineering

III Purushothama Raj P.; Ground Improvement Techniques

IV Nainan P. Kurian; Modern foundation: Introduction to advanced techniques

V Teng W.C.; Foundation Design
B.Tech. Sem. VII – Civil Engineering

2CI 708 Elective Paper – I (Design of Earthquake Resistant Structures-I)

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**Course Content:**

**UNIT I Introduction:**
Seismic tectonic / Seismic Environment of Indian Region, Seismic effect on Structures , Seismic Design Philosophy, Seismic Effects on Masonry Structures ,Seismic effect on Reinforced Concrete Building , Behavior of Beam & Column Joints, , Base Isolation System

**UNIT II Earthquake Basics:**
Earth interior, plate tectonics, faults, consequences of earthquake, Earthquake parameters, magnitude & intensity, scales, Seismic zones of India, damages caused during past earthquakes (world wide).

**UNIT III Fundamentals of Earthquake Vibrations of Buildings:**
static load v/s Dynamic load, (force control and displacement control), simplified single degree of freedom system modeling of buildings, natural frequency, resonance v/s increased response, responses of buildings to different types of vibrations like free and forced, damped and undamped vibration, response of building to earthquake ground motion, introduction to multi degree of freedom systems (mode shape).

**UNIT V Special topics:**
Introduction to soil liquefaction, structural control & Seismic strengthening

**UNIT VI Earthquake resistant Masonry features:**
Un-reinforced Masonry, Basics of masonry: units of masonry, good construction practice, Earthquake resistant features: bands and vertical reinforcement IS 4326, IS 13827, IS 13828

**TERM WORK:**
I Term work shall consist of Seismic design of RC multi-storey frame building with ductile detailing in A3 CAD drawings, at least 25 problems based on the course under Earthquake Engineering and Preparation of various models of structural systems OR seminar/project

**IS CODES:**
I Criteria for earthquake resistant design General provision & Building - IS: 1893 (Part I 2002)
III Code of Practice for earthquake resistant design & Construction of buildings - IS 4326 (1993)
GUIDELINES FOR IMPROVING EARTHQUAKE RESISTANCE LOW STRENGTH MASONRY BUILDINGS - IS 13828 (1993)

CODE OF PRACTICE FOR STRUCTURAL SAFETY OF BUILDINGS LOADING STANDARDS - IS : 875 (PART –III)

EARTHQUAKE TIPS 1-23.

REFERENCE BOOKS:

I. A.K. Chopra; Dynamics of Structures
II. Clough & Penzin; Dynamics of Structures
III. Manish Shrikhande & Pankaj Agrawal; Earthquake Resistant Design of Structures
IV. Park & Pauly; Behavior of RC Structure
V. John M. Biggs; Introduction to Structural Dynamics
B.Tech. Sem. VII – Civil Engineering

2CI 709 Elective Paper – I (Water Resources Engineering - I)

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**COURSE CONTENT:**

**UNIT I Introduction to Water Resources Engineering:** Water resources engineering, disciplines, water management sectors, water management community, computer models in WRE, units of measure.

**UNIT II Hydraulic Transients:** Basic equations for unsteady flow, pumps in pipelines, culverts, pipelines connecting reservoirs, and pipe network systems, unsteady flow, turbulent flow in pipes, boundary layers, generalized pipe system, simulation models.

**UNIT III Open Channel Hydraulics:** Rapidly varied flow, unsteady flow, generalized open channel hydraulics models, numerical methods.

**UNIT IV Flood Routing:** Hydrologic routing, kinematic routing, hydraulic stream routing, dam break analysis, watershed routing, generalized flood routing models.

**UNIT V Stochastic Hydrology:** Hydrologic random variables and data, probability relationships, binomial distribution and risk formula, empirical relative frequency relations, analytical probability distributions, frequency graphs, flood frequency analysis methods, flow-duration, concentration-duration, and low-flow frequency relationships, reservoir/river system reliability, precipitation frequency analysis, probable maximum storm.

**UNIT VI Ground Water Engineering:** Subsurface flow, basic equations of groundwater flow, wells, flow net analysis, numerical methods, ground water quality, generalized ground water models.

**TERM WORK**

Term work shall be based on the above mentioned course content.

**FIELD VISIT:**

Field visits based on course content are suggested.

**REFERENCE BOOKS:**

I Water Resources Engineering-Ralph A.Wurbs, Weshly P. James

II Watershed Hydrology by Peter E. Black

III Hydrology and Water Resources Engineering by James & Lee

IV Principles of Water Resources Planning by D. C. Goodman, S. Alvin

V Engineering Hydrology - K. Subramanya
COURSE CONTENT:

UNIT I  Physicochemical Treatment Process: Theory, principles and types of aeration and gas transfer. Gas stripping, filtration through porous media, softening, disinfection, desalination, ion exchange, adsorption, membrane processes, electro dialysis, tertiary treatments of wastewater. Physicochemical removal of dissolved organics, nutrient stripping, sludge dewatering and disposal, miscellaneous treatments like deflouridation etc.

UNIT II  Industrial Water and Wastewater: Water quality requirement for various industries, relevant IS standards and their significance. Composition and characteristics of following industrial wastewaters: Textile, dairy, food and fruit processing, brewery, pulp and paper mill, steel mill, fertilizer manufacturing unit, petrochemical, refinery, thermal power plants.

UNIT III Instrumental Methods of Analysis: Advance instrumental methods of analysis, turbidity meter, colorimeter, spectrophotometer, flame photometer, AAS, polarograph, chromatograph, etc. principles, calibration, range and applicability.

UNIT IV Environmental Chemistry: General chemistry, oxidation reduction equations in wastewater treatment, chemical precipitation, common ion effect, ion exchange chemistry.

UNIT V  Environmental Microbiology: Microbial growth & food requirements, various types & classification of microbes, microbiology of water & sewage, microbiology of milk, Environmental & Industrial microbiology, microbiology of air, Aquatic microbiology.

TERM WORK

Term work shall be based on laboratory experimental work, tutorials, detailed designs of appropriate units and shall include a seminar.

FIELD VISIT

Field visits based on course content are suggested.
REFERENCE BOOKS:

I  Environmental Chemistry By Sawyer & McCarty
II  Physicochemical Treatment BY Weber & Weber
III  Industrial Wastewater Treatment By Eckenfelder
IV  Wastewater Treatment By Metcalf & Eddy
B.Tech. Sem. VII – Civil Engineering

2CI 711 Elective Paper – I (Transportation Engineering - I)

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COURSE CONTENT:

(A) TRAFFIC ENGINEERING:

UNIT I  **Fundamental of Traffic Flow**: Basic components of traffic flow, road, user, vehicle, environment and their characteristics, speed-volume-density relationship, homogeneous and heterogeneous traffic flow, PCU concept, vehicle operating cost.

UNIT II  **Transportation Surveys**: O-D survey, spot-speed survey (Using enoscope and Radar Speedometer), traffic volume counts, travel time, parking survey, intersection volume count and delay survey, methods, analysis and interpretation.

UNIT III  **Accident Studies**: Records, analysis, safety measures, road safety audit.

UNIT IV  **Infrastructure Design**: Design of three arm junction, four arm junction, rotary intersection, parking area, road lighting, traffic signal design.

UNIT V  **Introduction of Computer Software**: TRIPS, TRANS-CAD, HCM, VISSIM and MX ROADS

(B) TRAFFIC MANAGEMENT:

UNIT I  **Highway Capacity Analysis**: level of service concept, HCM methods, IRC recommendations.

UNIT II  **Regulations**: Engineering, enforcement, education, environment measures.

UNIT III  **Traffic Control Devices**: Signs, markings, Islands, channelization, one way streets, speed breakers, bus stop location and bus bays, segregation, tidal flow arrangements, area traffic control, parking control, pedestrian flow control.

UNIT IV **Management Techniques**: Traffic regulations, vehicle, flow and general controls traffic control devices-traffic signs, road marking islands, signals channelization, one way streets, speed breakers, bus stop locations and bus ways, segregations, tidal flow arrangements, area traffic control, parking control types of parking design principles, parking restrictions, pedestrian control, zebra crossings, railings, footpaths, pedestrian signals foot over bridges, subways, traffic control measures-engineering enforcement, education environment, traffic management authorities, Road lighting.

UNIT V  **Intersection Control**: At grade intersections, unchannelized, channelized, rotary, signalized intersections with design principles, conflicts and turning restrictions, grade separated intersections, and interchanges.
TERM WORK

I Term work shall be based on the above mentioned course content.

Field Visit:

Field visits based on course content are suggested

REFERENCE BOOKS:

I S. K. Khanna & CEG Justo; Highway Engineering; Nemchand Brothers, Roorkee

II L R Kadiyali and N B Lal; Principles and Practices of Highway Engineering; Khanna Publishers, Delhi

III G V RAO; Principles of Transportation & Highway Engineering; TMH

IV S.C. Saxena; Traffic Planning and Design; Dhanpat Rai Pub., New Delhi

V S. K. Khanna & CEG Justo; Highway Material Testing; Nemchand Brothers, Roorkee

VI L. R. Kadiyali; Traffic Engineering and Transport Planning; Khanna Publishers, Delhi

VII Partho Chakraborty & Animesh Das; Principles of Transportation Engineering; PHI

VIII C. S. Papacostas; Fundamental of Transportation System Analysis; PHI

IX James H. Banks; Introduction to Transportation Engineering; WCB-McGraw Hill, New York
### B.Tech. Sem. VIII – Civil Engineering

#### 2CI 801 (Advanced Structural Design)

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#### COURSE CONTENT:

**UNIT I** Any 2 to 3 special structures from the list given below will be opted for design & details comprehensively as per current practice from planning to execution stage including staging design & cost calculation.

1. Industrial structures
2. Power plant structures
3. Bridges – RCC/PSC/Steel with substructure
4. Cooling towers
5. Hydraulic structures
6. Off-shore/ On-shore structures
7. Shell/ dome/folded plates/barrel vault structures – RCC/PSC/Steel
8. Earth Retaining structures
9. Storage structures like Bunker & silo

The selection of structures for academic term will be rotationally decided with the consensus of different institutes affiliated to the University

#### TERM WORK

1. Complete design & detailing in the form of A1- size drawing sheets using any CAD package. Complete documentation (report writing) showing design philosophy, calculations, cost analysis & other related matters for selected structures.
### B.Tech. Sem. VIII – Civil Engineering

#### 2CI 802 Construction Management

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**COURSE CONTENT:**

**UNIT I Introduction:**
Construction industry, construction team, Project types, Practice, need of management, types of management.

**UNIT II Project Planning:**
Planning philosophy, types of construction, Role of construction manager, Contractor, Project initiation, Project Organization.

**UNIT III Construction Network Analysis:**
Bar chart, Mile stone, network elements, development of network, time estimation, CPM, PERT approaches, CPM updating, network examples, LOR, PNA methodology

**UNIT IV Resources Planning & Management:**
Labour requirements & productivity, Equipment management, Material management, Inventory control, personnel management, resources planning, smoothing and levelling

**UNIT V Cost & Financial Management:**
Production function, Direct & Indirect costs, Contingency cost control system, Cash flow control, appraisal of projects, budgeting, time -cost optimization

**UNIT VI Project Control & Construction Safety:**
Control process, Areas of control, Schedule control, Monitoring, Quality control, Safety aspects

**UNIT VII Information system:**
Study of software like, MS Project, primavera etc.

**Practical/Tutorial/Drawing/Sketching:**
I Based on the course prescribed above.

**REFERENCES BOOKS:**
I B Sengupta & H Guha, “Construction Management and Planning”
III Punamia B.C., & Kandelwal K.K.,“Project Planning and Control”, Laxmi Publication, Delhi, (1990)
B.Tech. Sem. VIII – Civil Engineering

2CI 803 Urban Planning

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**COURSE CONTENT:**

**UNIT I** Town Planning Evolution & Development:
- Importance and scope of town planning,
- Planning in Ancient, Medieval, Modern Periods,
- Noted urban planners, planning legislation and administration in India

**UNIT II** Urban Growth & Structure:
- Urbanization, Trends, Growth phases, urban form, Activity system,
- Land use and density structure, Town structure, Town classification.

**UNIT III** Planning Mechanism & Surveys:
- Institutional framework, planning organizations, Civic surveys- types and significance

**UNIT IV** Urban Planning:
- Plan formats, Basic principles, Conventional and system approach in planning,
- Community planning, Land use planning, Neighborhood planning,
- Preparation & implementation of development plan, amenities, norms, Growth regulations, T.P. Scheme, New towns, Metro regions

**UNIT V** Service Network:
- Transport system, circulation network, standards, traffic problems,
- Water supply and sanitary network, other network services.

**UNIT VI** City Center & Renewal:
- CBD components, Town centers, Urban renewal programmes, Industries-types, Sites for Industries

**UNIT VII** Industries:
- Types, location, environmental consideration

**UNIT VIII** Housing:
- Planning of residential area, Housing byelaws , Housing density, Building forms, Housing projects, neighborhood housing
(B) Practical/Tutorial/Drawing/Sketching:

I  Study of Municipal Authority or urban Authority Bye-laws as applicable to housing societies
II  Analysis of a housing society
III  Designing a given housing society to meet the planning requirements and develop a landscape for the same.

REFERENCE BOOKS:

I  Modak N.V. and V.N. Ambdekar., “Town and Country Planning and Housing”, Orient Longman Ltd., New Delhi
B.Tech. Sem. VIII – Civil Engineering

2CI 804 Seminar

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COURSE CONTENT:

UNIT I Each student shall prepare a paper on any one topic offered by CED and present it after approval of the seminar guide on the notified date. Scope for development of a model is kept and report of the same along with the model is to be presented at seminar schedule. Assessment is by the department.
# B.Tech. Sem. VIII – Civil Engineering

## 2CI 805 Civil Engineering Project – II

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**COURSE CONTENT:**

**UNIT I** Design principles, procedures and design of various elements involved in the project covering the following broader areas:

- Water Supply & Sanitation Engineering -II
- Urban Storm Water Drainage-Design & Management -II
- Highway & Traffic Engineering -II
- Irrigations Engineering & Hydraulic Structures -II
- River Basin Management -II
- Urban Planning & Management-II
- Concrete Technology-II

**TERM WORK**

I The Term-work shall comprise of the preparation of design report (Hand Written), which shall include the project detailed drawing. The students shall present and defend their project work.

**Field Visit:**

I Field visits based on course content are suggested.
COURSE CONTENT:

UNIT I Introduction
Different types of bridges – Impact factor – Indian Road Congress Loads – Wind Load – Centrifugal forces – Economic span length – Foundation for bridges - Abutments

UNIT II Solid Slab Bridges
Slabs spanning in one direction – Slabs spanning two directions- Check for shear stresses

UNIT III Tee Beam and Deck Slab Bridges
General features – Courbon’s Method – Guyon – Massonet Method – Hendry Jaegar Method – Eccentric and Multiple concentric loads

UNIT IV Prestressed Concrete Bridges
Pre-tensioned and post-tensioned prestressed concrete bridges – Concordant cable profile – Design of End Block

UNIT V Balanced Cantilever Bridges
Segmental construction – Cast in place and precast balanced cantilever – Box section – Hinged or continuous beam system – Deck cabling arrangement

UNIT VI Steel Bridges
Plate girder bridge – Steel Trussed bridges – Composite bridges, Design of foundation, caissons & pile

REFERENCE BOOKS:

I Krishna Raju N. “Design of Bridges” – Oxford IBH Publication House, New Delhi, 2006
III Raina V. K “Concrete Bridge Practice – Analysis, Design and Economics”. Tata McGraw Hill Publication Co. Ltd., New Delhi, 2004
B.Tech. Sem. VIII – Civil Engineering

2CI 807 Elective Paper –II (Advanced Geotechnical Engineering-II)

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**COURSE CONTENT:**

**UNIT I  Shear strength :**
Review of conventional shear tests and factors affecting shear strength of soil. Triaxial test under different drainage conditions, Skempton's pore pressure parameters, sensitivity-thixotropy, critical void ratio, liquefaction phenomenon, its condition and preventive measures, Hvorslev's shear strength parameters, stress paths, Lambe's stress paths, stress paths for different field conditions.

**UNIT II  Consolidation & Settlement Analysis :**
Pre-consolidation pressure, Consolidation Ratio, Derivation and solution of Terzaghi's one-dimensional consolidation theory, Isochrones, extrapolation of field consolidation curve, secondary compression, estimation of immediate and consolidation settlement, factors affecting settlement, correction to computed settlement, introduction to three dimensional consolidation, sand drains, sand wicks, band drains.

**UNIT III  Earth Pressure :**
Critical study of earth pressure theories, Coulomb wedge analysis, active and passive earth pressure determination by graphical methods, earth pressure due to line load & surcharge acting on ground surface, earth pressure on strutted excavations, cantilever sheet pile wall, anchored sheet pile, Free earth support and fixed earth support.

**UNIT IV  Special foundations :**
Over view of foundation for water tanks & silos, telecommunication tower, foundation for under ground structure like tunnels & power house

**UNIT V  Ground Improvement Techniques:**
Necessity, different methods such as preloading and sand drains, vibroflotations, stone columns, blasting, and compaction piles, Electro-Osmosis, introduction to use of fly ash.
**TERM WORK**

1. The term work shall consist of laboratory work and assignments (minimum 30 problems & Seminar) based on the course of study under Geotechnical Engineering-I.

   Practical examination shall consist of oral based on term work

**REFERENCE BOOKS:**

3. Das Braja M; Principles of Foundation Engineering
4. Whitlow K; Basic Soil Mechanics
5. Jumikis Alfreds R; Soil Mechanics
6. Robert M. Koerner; Designing with Geosynthetics
B.Tech. Sem. VIII – Civil Engineering

2CI 808 Elective Paper – II (Design of Earthquake Resistant Structures - II)

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**COURSE CONTENT:**

I. **Structural dynamics**
   - Introduction to multi degree of freedom system - continuous mass v/s lumped mass, natural frequencies and mode shapes, Response spectrum analysis, modal analysis & time history analysis, Dynamics related to machine foundation.

II. **Design of Multi Storeyed Buildings:**
   - Design of multi-storeyed building (G+10) for various forces including earthquake & wind forces: Loads as per IS 875 & IS: 1893-2002 (Part I), Load combinations as per IS: 875 (Part V), Ductile detailing of RC building as per IS: 13920 1993

III. **Retrofitting and strengthening.**
   - Introduction, Essentials of seismic design of RCC and masonry buildings, Condition assessment of existing buildings, Goals and objectives of seismic Retrofit, Retrofit versus repair and rehabilitation, Steps of seismic retrofit, Retrofit of RCC building, Retrofit of Foundations.

IV. **Advances in Earthquake Engineering**
   - Structural control: Response of various Passive controls like Base Isolation System & various dampers, Active control, Semi-active control, Hybrid control

V. **Seminar based on topics related to syllabus.**

**Term work**
- Term work shall consist of Seismic design of RC multi-storey frame building with ductile detailing in A3 CAD drawings, ERD of elevated water tank/ ERD of chimneys & silos. At least 10 problems along with theory based on the course
- Preparation of various models of structural systems OR seminar/project
REFERENCE BOOKS:
COURSE CONTENT:

UNIT I Modelling Watershed Hydrology: Watershed hydrology, watershed models, watershed characteristics, methods for estimating peak flow, separating precipitation into abstractions and runoff, unit hydrograph approach for estimating flow rates, erosion & sediment yield, water quality modelling, generalized watershed simulation models.

UNIT II Urban Storm Water Management: Storm water collection systems, on-Site detention basins, regional detention facilities, water quality, flood damage assessment.


UNIT IV River Basin Management: River basin systems, dams, reservoirs and associated facilities, water rights and water allocation systems, water quality management, ecosystem management, rivers and reservoirs of India, major river/reservoir systems in the State of Gujarat, river basin management, computer models.

UNIT V Sustainable Water Resources Development: Threats to fresh water resources, climate change, depletion of aquifers, pollution of fresh water

UNIT VI Integrated Water Resources Management: Government Organisations (GO’s), Non Government Organisations (NGO’s), Participatory practices, Public-private partnerships, Water conflicts, Global agencies and their influences.

TERM WORK
I Term work shall be based on the above mentioned course content.

FIELD VISIT:
Field visits based on course content are suggested.

REFERENCE BOOKS:
I Water Resources Engineering-Ralph A.Wurbs, Weshly P. James
II Watershed Hydrology by Peter E. Black
III Hydrology and Water Resources Engineering by James & Lee
IV Principles of Water Resources Planning by D. C. Goodman, S. Alvin
V Engineering Hydrology - K. Subramanya
### Course: Environmental Pollution & Control - II

#### Course Details

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**COURSE CONTENT:**

**UNIT I Biological Treatment Process:** Microbial growth kinetics, suspended growth treatment - activated sludge process, process in biological nitrogen and phosphorus removal, design of activated sludge process and aerated lagoon.

Attached growth treatment - Trickling filters, rotating biological contactors. Combined aerobic treatment process.

Anaerobic suspended and attached growth biological treatment process - Design considerations, anaerobic suspended growth process, anaerobic sludge blanket process, attached growth anaerobic process.

**UNIT II Environmental Legislation:** Historical perspective, salient features, provisions and limitations of water Act. 1974.

Cess Act, 1977
Air Act, 1981
Environmental Protection Act 1986
A few case studies, role of NGOs.

**UNIT III Air Pollution:** Various air pollution, criteria air pollutants, pollution standard index, air pollution control, nature of air pollution control, control at source, control equipments and their design, cyclones, dry & wet scrubbers bag filters, ESP, Howard chamber.

**TERM WORK**

I It shall be based on experimental work, tutorials, detailed designs of appropriate units and shall include a seminar.

**FIELD VISIT**

Field visits based on course content are suggested.

**REFERENCE BOOKS:**

I Environmental Engineering By Birdie
II Air Pollution Control By Rao
III Air Pollution Control By Noel de Nevers
IV Wastewater Treatment By Metcalf & Eddy
B.Tech. Sem. VIII – Civil Engineering

2CI 811 Elective Paper – II (Transportation Engineering - II)

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COURSE CONTENT:

(A) TRAFFIC ENGINEERING:

UNIT I Principles of Transportation: Role of transportation in development of society, various existing modes of transportation and their advantages, disadvantages and limitations.

UNIT II Transportation Planning: Objectives of planning, planning studies, study area, zoning, inventory of travel pattern and characteristics, survey techniques, data processing analysis and interpretations, travel projection and forecasting.

UNIT III Coordination in Transportation: Principles, objectives advantages and limitation of co-ordination, factors affecting co-ordination, types of co-ordination, present state of art of co-ordination.


UNIT V Trip Distribution Analysis: Trip distribution, method of trip distribution, growth factor methods, analysis methods, gravity model, intervening opportunity model.

UNIT VI Route Assignment Analysis: Purpose of traffic assignment, general principles, all or nothing method of assignment, capacity restraint assignment techniques, diversion curve method, TRC model, Detroit model.

UNIT VII Model Split Analysis: Choice of travel mode, basic approach for modal split analysis, trip and models, trip interchanges model, two stage model split, logit models for mode choice.

(B) PAVEMENT DESIGN

UNIT I General: Pavement its functions, types of pavement, factors affecting pavement performance and design traffic factors, characteristics of sub-grade and payment materials, moisture and climatic factors. Pavement and its functions, types, components, affecting factors, wheel loads, ESWL and ESAL concepts.

UNIT II Pavement Materials:

- Soil: Properties, classification, compaction, OMC, CBR, Shear and Plate bearing tests. (Field and Lab CBR)
- Aggregate: Types, tests, desired properties, blending methods for desired gradation.
- Bituminous material: Types, tests, desired properties, blending methods. Marshal stability test of Core
sample and Bitumen content of the sample.

**Mix Design:** Marshall Stability test. Over lay design (Benkelman Beam method)

**UNIT III Flexible Pavement Design:** Design criteria, design parameters, Design methods, empirical, semi-empirical and theoretical methods, design concepts, IRC recommendations.

**UNIT IV Pavement Evaluation And Strengthening:** Pavement failures in flexible and rigid pavements, pavement evaluation, deflection survey and serviceability rating techniques, strengthening of pavements, strengthening techniques, maintenance, overlays design, replacement. Bump Integrator and Benkelman beam method of pavement evaluation as per CRRI and IRC recommendation.

**UNIT V Rigid Pavement Design:** Design Criteria, design parameters, critical regions, stresses due to wheel loads, temperature stresses, Fatigue analysis, combination of stresses, design methods, joints and their design, IRC recommendations.

**TERM WORK**

I Term work shall be based on the above mentioned course content.

**Field Visit:**

Field visits based on course content are suggested

**REFERENCE BOOKS:**

I S.C. Saxena; Traffic Planning and Design; Dhanpat Rai Pub., New Delhi

II L. R. Kadiyali; Traffic Engineering, and Transport Planning; Khanna Publishers, Delhi

III Partho Chakraborty & Animesh Das; Principles of Transportation Engineering; PHI

IV C. S. Papacostas; Fundamental of Transportation System Analysis; PHI

V James H. Banks; Introduction to Transportation Engineering; WCB-McGraw Hill, New York

VI N. D. Vohra; Quantitative Techniques in Management; TMH