

CE 8.1 IRRIGATION AND WATER RESOURCES ENGINEERING

Scheme of Instruction			Scheme of Examination				
L	T	P	Theory	Int. Asst.	Orals	Pract	Total
4	2	0	100	25	50	-	175

Module I

1. Introduction : Necessity. History of Irrigation in India, Different methods of irrigation, Principles of planning and operation of multi purpose projects, phases of development and cost benefit ratio; recent developments-inter and intra basin transfer of water
2. Water Requirement of Crops : Duty and delta, base period of crops, Factors affecting duty, Methods of improving duty, Crop seasons in India
3. Basic Hydrology : Hydrological cycle, Precipitation, Rainfall, Measurements of rainfall, evaporation and evapo-transpiration, infiltration and soil moisture; stream flow measurement; Runoff, Factors affecting runoff, Catchment classification, Flood estimation, Hydrograph, Unit hydrograph; Hydrologic design-PMF, PMP, SPS and SPF.

Module II

4. Ground water : Deep and shallow wells, Tube wells, Design of tube wells, Construction of tube wells, Methods of drilling, Development of tubewells, Types of aquifers, storage coefficient, specific capacity, yield, ground water exploration.
5. Storage Reservoirs : Physical characteristics of reservoirs, reservoir capacity for a given yield -mass curve, Reservoir reliability, Sedimentation control, Reservoir leakage, ideal site for reservoir
6. Dams : Type of dams, Selection of types of dams, Forces on dams, Methods of design of gravity dams. Construction features, Elementary principles of design of Arch and Buttress dams. Their suitability, Methods of construction of Earth and Rockfill dams, Elementary principles of design of earth dam, Failure of earth dam
7. Surplus works: Different types of spillways - suitability of various types - Energy dissipation works-Different types of crest gates - Outlet work - Scour protection below spillways

Module III

8. Diversion Head Work: Component parts - River Weirs, Causes of failures. Remedies - Creep theories. Design of vertical drop weir and u/s and d/s aprons and exit gradients - Methods of construction. divide wall, fish ladder, cover sluices, canal head regulator - Design - Location of head works - Effect of construction of weir on regime of river.

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9. Distribution system: Canals, classification, alignment, losses. Design of canal lining, Inundation canals, other canal irrigation systems.
  10. Canal Regulation works: Types of falls, Design of falls , Distributory and Head regulators , escapes, principle of design.
  11. Cross Drainage Works : Necessity, Design principles of Aqueducts, Siphon Aqueducts, Super Passages, Level crossings, Site selection.

#### Module IV

12. Hydro power engineering- role of hydropower, components of plants, energy potential determination.
13. Management of water resources- Erosion control and watershed development, rainwater-harvesting and recharge of ground water; Water logging and control : Causes and effects of water logging, anti water logging, method of drainage and reclamation of water logged areas and alkaline soils, salt efflorescence: Mitigation strategies for floods and droughts; role of society and people's participation for sustainable water resources development.

#### **Tutorials:**

At least one assignment from each module.

#### **Text books:**

Irrigation Engineering by Punmia , Pande, Lal.  
Irrigation and Water Resources Engineering by P.N.Modi  
Irrigation Engineering by R.K.Sharma & T.K.Sharma  
Irrigation Engineering by Basak

#### **Reference Books :**

Elementary Hydrology by Vijay P. Singh  
Hydrology in Practice by Elizabeth M Shaw  
Hydrology for Engineers by Linsley, Kohler  
Water Resources Engineering by Larry W Mayas

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B.E(CIVIL) SEMESTER VIII

**8.2 CONSTRUCTION PROJECT MANAGEMENT**

Scheme of Instruction			Scheme of Examination				
L	T	P	Theory	Int. Asst.	Orals	Pract	Total
4	2	0	100	25	50	-	175

**Module-I**

1. **Introduction: Significance of construction management.** Construction industry, Construction Projects, Project Development Process, Project Management, Main Causes of Project Failure

2. **Project Planning Scope:**

Plan Development Process, Time Planning Process, Work Scheduling Process, Resource Planning Process, Project control process, Importance of Planning, Scheduling and Controlling Projects, Functions and Role of Chief Planner.

**Module-II**

3. **Project work Breakdown and Network Analysis:**

Project work – Breakdown levels, Determining Activities Involved, Assessing Activity duration, activity costs and Earned Value, Work Breakdown of a new Cantonment Project.

CPM Network analysis Fundamentals and Procedure, PERT Network Analysis. PERT versus CPM

4. **Precedence Network Analysis and Project work Scheduling:**

Precedence Network Analysis (PNA) fundamentals, Case Illustrations, Classification of Networks, Guidelines for drawing Project Network  
PNA versus CPM.

Purpose of work Scheduling, Bar chart method of work Scheduling, Scheduling the Network Plan, Line of Balance Method of Scheduling Repetitive Projects. Factors affecting work Scheduling, Forecasting inputs and outputs, Schedule Hierarchy.

**Module-III**

5. **Planning Construction Manpower and Materials.**

Establishing workers Productivity Standards, Scheduling Construction Site Workers, Project Manpower Grouping and Designing Workers Financial Incentive Scheme.

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ABC Classification of construction Materials, Materials Usage Standards, Materials Provisioning Process, Planning Materials Inventory, Use of Operations Research in Materials Planning

#### 6. Project Construction Equipment

Classification of Major Equipment, Earth factor in Earthwork, Earth Excavating Equipment, Earth Cutting and Hauling Equipment, Earth compacting and Grading Equipment, Concreting Plant and Equipment, Cranes for Materials Hoisting. Selecting Construction Equipment.

### Module-IV

#### 7. Planning Construction costs and Construction Budgets

Classification of Construction Costs, Unit Rate Costing Standards of resources, Work Package standard Cost, Standard 'S' Curve Forecasting Tool.

Structuring Responsibility Centres, Sales Revenue Budget, Operating Expenses Budget, Costs Inflation, Escalation and contingencies, Budgetary Forecasts, Project Master Budget, Importance of Project Budget.

#### 8. Project Control:

Project Control Methodology – Control System, Resources Productivity Control, Project Cost Control, Project Time Control.

Basics of Codification of the Planning System and Project Management Information System.

### INSTRUCTIONAL STRATEGY

To achieve this objective the students shall be taken to different work sites for clear conception of particular topics, such as site organization, inspection of works at various stages of construction.

#### Site Visits

The Students shall visit any one Construction site at different stages (at least 3) of Construction.

#### Tutorials

- 1) Develop one PERT chart on any phase of Construction
- 2) Develop one PERT chart for the entire Construction project
- 3) Develop one CPM chart on any phase of Construction
- 4) Develop one CPM chart for the entire Construction project
- 5) Study of One Budget Estimate for any construction Site.
- 6) Study of MS Projects Software and Assignments on the same.

  
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### TEXT BOOK

1. K. K. CHITKARA, "CONSTRUCTION PROJECT MANAGEMENT", Tata McGraw hill Publishing Company Limited.
2. Srinath, LS, "PERT and CPM - Principles and Applications", New Delhi, East West Press New Delhi
3. Peurifoy, RL, "CONSTRUCTION PLANNING, EQUIPMENT AND METHODS" Tokyo, McGraw Hill Publishing Company

### REFERENCE BOOKS

1. Harpal Singh, "CONSTRUCTION MANAGEMENT AND ACCOUNTS", New Delhi, Tata McGraw Hill Publishing Company
2. Dharwadker, PP; "MANAGEMENT IN CONSTRUCTION INDUSTRY", New Delhi, Oxford and IBH
3. Gahlot PS; Dhir, BM; "CONSTRUCTION PLANNING AND MANAGEMENT", Wiley Eastern Limited,

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Scheme of Instruction			Scheme of Examination				
L	T	P	Theory	Int. Asst.	Orals	Pract	Total
4	2	0	100	25	50	-	175

### Module-I

#### 1. Introduction

General comments, Historical development, Computer hardware and software, Computer methods vs. classical methods, Flexibility and stiffness concept for a spring, Stiffness matrix of a two-degree of freedom system, Solution methods for linear systems of matrix equations, Direct spreadsheets solutions, Gauss decomposition method, Implementation on computer algebra systems, Examples

#### 2. Stiffness matrix of uniaxial members and assemblage of structural stiffness for trusses.

Basic equations, Superposition principle, Flexibility and stiffness concept, Element stiffness matrix of spring, bar, Coordinate transformation. Direct stiffness method, General assemblage procedures for trusses, Examples

### Module - II

#### 3. Stiffness formulation for beams and 2-D frames, Beam Element

Nodal displacements and forces, Planar frame element, Coordinate transformation, Illustrative examples, Assemblage of structural stiffness by direct method, General assemblage algorithm, Computer programming for stiffness calculations, Examples.

### Module-III

#### 4. Computer software applications for structural analysis

Applications of VBA or Excel matrix methods, Typical FEM programs - Sap 2000 or STAAD/GTStrudl, Typical FEM programs - ETABS Non-linear, Data entry with simple examples

#### 5. Structural modelling and analysis features, Modelling of Buildings & Modelling of Bridges

Modelling of buildings - Introduction, Basic components, Special considerations, Example problems using computer program applications, Modelling of bridges - Introduction, Basic components, Special considerations, Example problems using computer program Applications

### Module- IV

#### 6. Dynamic analysis

Equations of motion, Natural vibration, Dynamic analysis by modal superposition, direct integration methods, CAS-assisted solution methods, Examples for dynamic analysis.

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**Tutorials:**

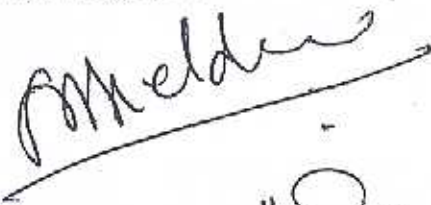
At least 1 assignment from each modules

**Text Books:**

1. Lewis P. Felton & Richard B. Nelson, *Matrix Structural Analysis*. John Wiley & Sons, 1997.
2. R. L. Sack, *Matrix Structural Analysis*, PWS-Kent Publishing Company, Boston, 1989.
3. W. McGuire, R. H. Gallagher & Ronald D. Ziemian, *Matrix Structural Analysis*. 2nd Edition, John Wiley & Sons, Inc., 2000.

**Reference Books:**

1. "ETABS-Three Dimensional Analysis of Building Systems, User Manual", Computers & Structures, Inc., May 1995.
2. S. Wolfram, *The Mathematica Book*, 4th Edition, Cambridge University Press, 1999.
3. "SAP2000 Program Manual", Computers & Structures, Inc., 16 August 1997.



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### Elective III Sem VIII

#### CE 8.3.3 INDUSTRIAL WASTE TREATMENT

Scheme of Instruction			Scheme of Examination				
L	T	P	Theory	Int. Asst.	Orals	Pract	Total
4	2	0	100	25	50	-	175

#### Module I

Introduction, objectives of Industrial waste treatment, properties & analysis of wastewater. Difference between Industrial & Municipal waste. Impact of waste on streams, Stream standards & Effluent standards. Computation of organic waste loads on stream - Streamer Phelps Equation, statement, application & problem solving.

#### Module II

Sampling techniques. Types of Sample- Grab, Composite & Integrated samples, continuous monitoring & Biomonitoring. Forecasting of Industrial waste use & treatment practices. Treating different effluent stream- separately, jointly after mixing and treating Industrial waste with Municipal waste.

#### Module III

Pretreatment of Industrial waste- Volume reduction, Strength reduction, Neutralization, Equalization & Proportioning. Removal of organic & inorganic dissolved solids. Ultimate disposal of waste water & its effects on soil and water bodies.

#### Module IV

Waste treatment in specific Industries like Distillery, Brewery & Winery, Dairy, Cane Sugar, Fertilizer, pesticides, textile, pharmaceutical and Petrochemical with their Processes, Characteristics, effects, treatment by-product recovery & reuse of treated water with flow chart.

#### Tutorials:

Shall consist of the following:

1. Minimum of four assignments based on the syllabus, one on each module
2. Field visit report with detailed drawing of process of manufacturing and waste water treatment of any two industries based on syllabus.
3. Analysis of industrial waste of any one industry for minimum five different parameters like B.O.D., C.O.D., pH, S.S, Na, K, chloride, conductivity, turbidity etc.

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**Text Books:**

Industrial waste treatment by Neumarrow

Pollution Control in process Industries by Mahajan

**Reference Books:**

Industrial waste pollution control by Eckenfelder,

Waste water treatment for pollution control by S. J. Arceivala

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Elective IV Sem VIII

CE 8.4.1 SOIL DYNAMICS AND MACHINE FOUNDATION

Scheme of Instruction			Scheme of Examination				
L	T	P	Theory	Int. Asst.	Orals	Pract	Total
4	2	0	100	25	50	-	175

Module I

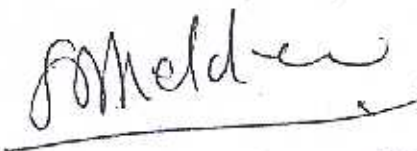
- 1 **Theory Of Vibration:** General, Definitions, Harmonic motion, Vibration of a single degree freedom system, Free-undamped, Free-damped, Forced-undamped and Forced-Damped vibrations, Introduction to multiple degree freedom system.
- 2 **Wave Propagation:** General, Stress, strain and elastic constants. Longitudinal and torsional elastic waves in a rod of infinite length, Longitudinal and torsional elastic waves in a rod of finite length, Wave propagation in an infinite, homogeneous, isotropic, elastic medium, Wave propagation in elastic half space.

Module II

- 3 **Dynamic Soil Properties:** Natural frequency, mass parameter, damping factor, spring constant, dynamic elastic constants, coefficient of elastic uniform compression, coefficient of elastic uniform shear. Laboratory techniques- Resonant column test, Ultrasonic pulse test, cyclic simple shear test. Field Tests: Vertical and Horizontal block resonance tests Cyclic plate load test.
- 4 **Dynamic Bearing Capacity:** General, Pseudo-static analysis, Generalized bearing capacity equation, Factors affecting bearing capacity, Factor of safety, Dynamic analysis.

Module III

- 5 **General Principles of Machine Foundation Design:** General, Types of machines and foundations, General Requirements of machine foundation, Permissible amplitudes, Allowable soil pressure, Permissible stresses.
- 6 **Foundation for Reciprocating Machines:** General, Modes of vibrations of a rigid foundation block, Methods of analysis-Linear elastic weightless spring method, Elastic half space method, Effect of foundation shape on vibratory response, Design of block foundation.

  
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### Module IV

**Foundation for Impact Type Machines:** General, Arrangement of anvil on foundation, Dynamic analysis of foundation for impact type of machines, Design of hammer machine foundation.

**Foundation for Rotary Machines:** General, Special considerations, design criteria, Loads on foundation, Methods of analysis, design of foundation for rotary machines.

**Vibration Isolation and Screening:** General, Force isolation technique, Motion isolation technique, Screening of vibration by use of open trenches, Passive screening of vibration.

**Tutorials:** At least 1 assignment from each module

### Text Books

- Soil dynamics and machine foundation – Swami Saran
- Machine Foundation – Srinivasan
- Foundation Engineering – Kasmalkar

### Reference Books

- Dynamics of bases and foundations – Barken
- Soil mechanics in engineering practice – Terzaghi
- Relevant IS Codes

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## Elective IV Sem VIII

CE 8.4.2 Advanced Engineering Geology

Scheme of Instruction		Scheme of Examination				
T	P	Theory	Int. Asst.	Orals	Pract	Total
2	0	100	25	50	-	175

## le -I

histories: Important Indian case histories related to Engineering geology.

Excavation and Rock weathering: A) Rock Excavation: Methods of excavation and for stones. Stability of slopes.

Rock weathering: Engineering classification of weathering, characteristics of soils derived from different types of rocks in different climates.

## e -II

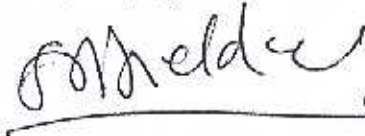
Investigation and exploration: Introduction. Surface investigation: Preliminary reconnaissance and its importance. Detailed sub-surface investigation: Geological and geophysical exploration. Methods of drilling and their efficiency. Core recovery and core

Engineering seismology: Introduction, Plate tectonics and earth quakes, Ground condition and seismicity, Methods of seismic investigation, Dynamic analysis, Seismic Zoning, Structural analysis and its prevention, Induced seismicity, Earthquakes and dams.

## -III

Discontinuities: Classification. Description of jointed rock mass. Geometrical analysis of rock mass system. Detection of discontinuity in borehole.

Mechanics of rock structures: Mechanics of folding and faulting, Origin of joints cleavage, foliation and lineation and their classification. Stereographic projections.



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#### Module-IV

**Groundwater and Geotechnical Problems:** Pore pressure. Role of groundwater in causing landslides and instability of slopes. Influence of groundwater on dams, reservoirs and Tunnels.

Underground storage spaces for various purposes. Disposal of waste materials. Ground water contamination. Artificial recharge of ground water

#### Literature:

1. Problems on structural Geology (Borehole data, stereographic projection).
2. Completion of outcrops and preparation of geological sections.
3. Interpretation of resistivity and seismic refraction data.
4. Aerial photo interpretation.
5. Basics of groundwater flow nets.

#### Text books

Geotechnical features of major dams in India. (Special publication on the occasion of IV International Association of Engineering Geology 1982.)

Fundamentals of engineering geology: F.G.Bell

Rock Engineering Applications: Franklin and Dusseault

Engineering Geology and geotechnics: F.G.Bell.

Structural Geology: M.P.Billings.

#### Reference Books:

Groundwater: Cherry and Freeze.

Mineral Geology: McKinstrey.

Engineering Geology and Geotechnics: D.P.Krynine and Judd.

Rock Engineering: Franklin and Dusseault

Groundwater hydrology: D.K.todd.

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### CE 8.4.3. EARTHQUAKE RESISTANT STRUCTURES

Scheme of Instruction			Scheme of Examination				
L	T	P	Theory	Int. Asst.	Orals	Pract	Total
4	2	0	100	25	50	-	175

#### **MODULE-I**

1. Interior of earth, Engineering geology of earthquakes, plate tectonics, faults, seismic waves, quantification of earthquake, basic geography & tectonic features of India.
2. Magnitude, energy intensity of earthquake, accelerograph, accelerogram, wave measuring instruments, recording and analysis of earthquake records, characteristics of strong ground motions, determination of magnitude, epicenter, epicentral distances, focal depth

#### **MODULE-II**

3. Guidelines for achieving efficient seismic resistant planning & design, I.S.. selection of sites, importance of architectural features in earthquake resistant building, continuity of construction, projection & suspended parts, special construction features like separation of adjoining structure, crumple section, stair case etc., geotechnical design considerations, twisting of building, seismic effect on structure, inertia forces, horizontal & vertical shaking
4. Indian seismic codes, Behavior of masonry structure during earthquake, bands & reinforcement in masonry building opening in walls, importance of flexible structure, principle of ductile building, capacity design concept, seismic design philosophy for building, concept of earthquake resistant building
5. Introduction of various techniques for reduction of earthquake effect in building, base isolation seismic dampers etc

#### **MODULE-III**

6. Behavior of R.C. building in earthquake, Design strategy, Strength, ductility of reinforced concrete members subjected to flexure, axial loads and shear. detailing of reinforced concrete members, beams column.

Behavior of beam column joints, Design strategy, Strength, ductility of beam column joints, footing for ductile behaviour, codal provisions, short column behaviour, architectural aspect of shear wall, ductile design of shear wall.

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### MODULE -IV

8. Special aspects in multistoried building structural response to earthquake, analysis of earthquake forces on multistoried frame by I.S. 1893 P-I,
9. Behavior and design strategy for open ground storey-delta effect, effect of soil structure interaction on building response.
10. Study of I.S. 1893 Part I to V for analysis and ductile design of structure.

#### Tutorials:

1. Dynamics of a multi storied building frame subjected to harmonic base motion OR equivalent analytical analysis.
2. Dynamics of a one-storied building frame with planar asymmetry subjected to harmonic base motions OR equivalent analytical analysis.
3. Dynamics of a multi storied building frame subjected to periodic (non-harmonic) base motion OR equivalent analytical analysis.
4. Vibration isolation of a secondary system OR equivalent analytical analysis.
5. Dynamics of a vibration absorber OR equivalent analytical analysis.
6. Dynamics of one-span and two-span beams OR equivalent analytical analysis.

#### TEXT BOOKS

1. R.L. Wiegell: Earthquake Engineering, Prentice Hall Inc
2. James L. Stratta : Manual of Seismic Design , Pearson Education Publication.
3. A.K. Chopra : Dynamics of Structures.

#### REFERENCE BOOKS

1. I.S.1893-2002 Part I to V
2. I.S.13920-1993
3. Farzad Neaim: Handbook on Seismic Analysis & Design of Structure

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## Elective IV Sem VIII

CE 8.4.4 DESIGN OF BRIDGE STRUCTURES

Scheme of Instruction			Scheme of Examination				
L	T	P	Theory	Int. Asst.	Orals	Pract	Total
4	2	0	100	25	50	-	175

**Module No.-I**

*types*  
Classification Of Bridges- Arch, Slab, Box Culvert, Beam And Slab, Plate Girder, Cable Bridge, Investigation And Planning For Bridges, Design Flood Discharge, Linear Spacing

**Module No.-II**

For Bridges, General Design Of Concrete Bridge Superstructure:-IRC Loadings, Dead Load, Live Load, Impact Load, Wind Load, Longitudinal And Horizontal Forces. Design of Bridge Superstructure

**Module No.-III**

Analysis of Abutments and Piers:-General Scour at Abutments and Piers, Grip Length, Design of Abutments and Piers and Stability of Abutments and Piers for Different Loading Conditions

**Module No.-IV**

Foundations: Types of bridge foundations, stability of different types of foundations, Design of shallow, pile, well foundations and pneumatic caissons

als:  
1 assignment from each module

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Design Of Concrete Bridges-V.N.Vazirani, M.M. Ratwani  
Design Of Bridges Structures -T.R. Jagadeesh, M.A.Jayaram  
Essential Of Bridge Engineering -D.J.Victor

ce books

Engineering -S. Ponnuswamy  
IRC -22, IRC-37

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*\* classification of bridges is more appropriate word 'loading' rather than type!*

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CE 8.5 Civil Engineering Project

Scheme of Instruction			Scheme of Examination				
L	T	P	Theory	Int. Asst.	Orals	Pract	Total
-	-	12	-	50	50+50*	-	150

\*50 marks for the project report and 50 marks for orals (to be jointly assessed by both the examiners)

The project work initiated in semester VII shall be continued and periodically assessed by the project guide. A hard copy shall be compiled and submitted at the end of the semester.

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