

**SYLLABUS OF**

**FOURTH YEAR (CIVIL)**

**NORTH MAHARASHTRA  
UNIVERSITY, JALGAON.**

**(w.e.f. 2008-09)**

**NORTH MAHARASHTRA UNIVERSITY, JALGAON**  
**STRUCTURE OF TEACHING AND EVALUATION**  
**B.E. (Civil) w. e. f. 2008 - 09**

**FIRST TERM**

| Sr. No | Subject  | Teaching Scheme Hours/Week |          |           | Examination Scheme   |       |     |     |     |
|--------|--|----------------------------|----------|-----------|----------------------|-------|-----|-----|-----|
|        |  | Lectures                   | Tutorial | Practical | Paper Duration Hours | Paper | TW  | P R | OR  |
| 1      | Construction Management- I   | 4                          | -        | 2         | 3                    | 100   | 25  | -   | 25  |
| 2      | Water Resources Engineering –I   | 4                          | -        | -         | 3                    | 100   | 25  | -   | -   |
| 3      | Quantity Surveying & Valuation   | 4                          | -        | 2         | 3                    | 100   | 25  | -   | 25  |
| 4      | Environmental Engineering - II   | 4                          | -        | 2         | 3                    | 100   | -   | -   | 25  |
| 5      | Elective- I<br>i) Open Channel & Conduit Flow<br>ii) Water Shed Management<br>iii) Finite Element Method | 4                          | -        | 2         | 3                    | 100   | 25  | -   | --  |
| 6      | Seminar  | -                          | -        | -         | -                    | -     | 25  | -   | -   |
| 7      | Project –Stage I   | -                          | -        | 2         | -                    | -     | 25  | -   | 25  |
|        | <b>Total</b>   | 20                         | -        | 10        | -                    | 500   | 150 | -   | 100 |
|        | <b>Grand Total</b>   |                            | 30       |           |                      | 750   |     |     |     |

**SECOND TERM**

| Sr. No | Subject   | Teaching Scheme Hours/Week |          |           | Examination Scheme   |       |     |     |     |
|--------|---|----------------------------|----------|-----------|----------------------|-------|-----|-----|-----|
|        |   | Lectures                   | Tutorial | Practical | Paper Duration Hours | Paper | TW  | P R | OR  |
| 01     | Structural Design & Drawing – III   | 4                          | -        | 4         | 4                    | 100   | 25  | -   | 25  |
| 02     | Construction Management- II   | 4                          | -        | 2         | 3                    | 100   | 25  | -   | 25  |
| 03     | Water Resources Engineering. –II  | 4                          | -        | 2         | 3                    | 100   | 25  | -   | 25  |
| 04     | Elective–II<br>i) Water Power Engineering<br>ii) Geographical Information System<br>iii) Industrial Pollution & Control | 4                          | -        | 2         | 3                    | 100   | 25  | -   | -   |
| 05     | Site Visit /Case Study  | -                          | -        | -         | -                    | -     | 25  | -   | -   |
| 06     | Project–Stage II  | -                          | -        | 4         | -                    | -     | 100 | -   | 50  |
| 07     | <b>Total</b>  | 16                         | -        | 14        | -                    | 400   | 225 | -   | 125 |
|        | <b>Grand Total</b>  |                            | 30       |           |                      | 750   |     |     |     |

**NORTH MAHARASHTRA UNIVERSITY, JALGAON**  
**SYLLABUS OF FOURTH YEAR (CIVIL)**  
**TERM-I<sup>ST</sup> (w.e.f. 2008-09)**

**CONSTRUCTION MANAGEMENT-I**

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**Teaching Scheme:**

Lectures: 4 Hours/Week

Tutorial: 2 Hour/Week

**Examination Scheme:**

Theory Paper: 100 Marks (3 Hrs)

Term Work: 25 Marks

Oral: 25 Marks

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**UNIT--I**

**(10 Hours, 20 marks)**

Construction industry, construction team, Construction activities, classification of construction ,stages in construction, Need of management in construction, Ownership and entrepreneurship , Small scale industries in construction .

Jab layout, mass housing and value engineering.

Scientific management, Management technique and uses, Definition and objectives of management, levels of management, Leadership and its quality.

Organization, meaning and function , forms of organization - line, line and staff , functional ,Type A, Type B and Type C

**UNIT—II**

**(10 Hours, 20 marks)**

Network Technique :- History, Advantages, Bar charts, S –Curve etc. various terms used in network technique, activity, . event, critical path, duration etc. Development of networks, network scheduling, to find various times and float. EST, EFT, TF etc. Monitoring of Network, Three phases of network technique.

PERT - its concept and PERT Time.

**UNIT—III**

**(10 Hours, 20 marks)**

Cost analysis, Cost Curve, Optimization and crashing of networks. Updating of network

During monitoring, resource leveling, allocation, leveling and smoothing.

Line of balance - Concept and uses.

**UNIT – IV**

Engineering economics, its definition and importance, demand and supply, factors affecting demand and supply. Production, its meaning, different factors of production, economics of production, cost concept, relationship of cost to level of production.

Bank, its type, uses and functions, banking systems, profit and loss account, appreciation and depreciation of money.

**UNIT - V**

a) Pile driving Equipments:-

Pile hammers, drop, single acting steam, double acting steam, differential acting steam, diesel, vibratory , hydraulic hammers , sonic hammers, selection of pile driving hammers.

b) Crushers – types , primary, secondary ,tertiary crushers, jaw, gyratory, cone crushers, hammer mills, roll crushers, rod and ball mills Screening aggregate, revolving, vibrating screens

c) Ready mix concrete plants :- central concrete batch plant , portable concrete batch plant, ready mixed concrete – central mixed , shrink mixed, truck mixed concrete, concrete pumps.

**TERM WORK:-** It shall consist of assignments based on each unit of above syllabus.

**BOOKS RECOMMENDED:-**

1. Mahesh Varma - Construction planning and management
2. S.V.Deodhar - Construction equipment and job planning
3. U.K.Shrivastava - Construction Management

4. Gehlot and Dhir - Construction Management
5. L.S.SrinathEngineering - CPM and PERT
6. Peurifoy - Construction Planning and Management
7. Tarachand - Engineering Economics
8. Sengupta - Construction Management and planning
9. Chitkara - Construction Project Management
10. Mukund Mahajan - Engineering Economics
11. R.L.Peurifoy - Construction planning ,Equipments and Methods.
12. Dr. Mahesh Verma - Construction equipments and its planning and application

## WATER RESOURCES ENGINEERING - I

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**Teaching Scheme:**

Lectures: 4 Hours/Week

Practical: 2 Hour/Week

**Examination Scheme:**

Theory Paper: 100 Marks (3 Hrs)

Term Work: 25 Marks

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**UNIT I****(10 Hours, 20 marks)**

Hydrologic cycle, Hydrology & Water resources development, Surface hydrology and sub-surface hydrology

Precipitation – Mechanism, essential requirement for occurrence, Different Forms, Types, Measurement of Precipitation – Different types of rain gauges- non-automatic and automatic, Radar measurement, Methods to find out the areal average depth of precipitation, Mean monthly precipitation, annual average precipitation, Optimum number of rain gauge stations, Estimation of missing data, Checking for consistency of data

Rainfall Intensity analysis, Frequency Curve, Depth Area Duration Curve

Disposal of precipitation - Factors affecting disposal, Evaporation Losses, Evapo-transpiration, Factors affecting evapo-transpiration, methods for measurement of evaporation and evapo-transpiration, Infiltration – methods for determination, factors affecting, infiltration indexes

**UNIT II****(10 Hours, 20 marks)**

Discharge Measurement in Streams – Methods (Area Velocity, Moving Boat, Chemical), Selection of gauge site, Stage Discharge Relationship, Extension of Rating Curves, Slope Area Method

Run-off – Runoff Process, Runoff Cycle, Factors affecting Runoff, Estimation

Catchment -Classification & Salient Characteristics

Floods – Necessity, Causes, Factors affecting, Classification, Frequency, Estimation

Hydrographs – Definition, Components, Factors affecting the shape, Base flow separation, Flood Hydrograph, Unit Hydrograph, U.H.methods, S-hydrograph (S-curve technique), Synthetic Unit Hydrograph

**UNIT III****(10 Hours, 20 marks)**

Ground water hydrology: - Occurrences and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, permeability, yield of basins. Hydraulics of well under steady flow, condition in confined and unconfined aquifers, specific capacity a well, well irrigation: tube wells, open wells, their design and construction.

Water logging and drainage engineering - Causes of water logging, preventive and curative measures, drainage of irrigated lands, reclamation of water logged, alkaline and saline lands, design and spacing of the tile – drain.

**UNIT IV****(10 Hours, 20 marks)**

Reservoir Planning – Advantages, Classification, Types of developments: Storage and diversion works. Single and multi-purposes reservoir, investigation for locating a reservoir, selection of site, height of the dam, reservoir, economics of reservoir planning, Benefit – cost ratio,

Reservoir Sedimentation – Process of Erosion, Factors affecting erosion, Mechanism of Sediment Transport, Sediment Yield, Distribution of sediment in reservoir, Factors affecting silting, Estimation of silt load, & Mode of sedimentation, Trap efficiency of reservoir, Control of reservoir sedimentation

Necessity and layouts of Lift Irrigation Schemes, Drip & sprinkler irrigation system

**UNIT V****(10 Hours, 20 marks)**

Introduction to Irrigation - Definitions, functions, necessity, benefits, Ill effect, Irrigation System & its classification, Irrigation Methods & its classification, (Surface & Sub-surface Methods), Factors affecting choice of method,

Soil Water Plant Relationship – Classification of soil water, Soil moisture stress, Soil moisture tension, Saturation capacity, Field capacity, Determination of field capacity, Major Soil Groups in India, Maintaining the soil fertility, Essential Elements for Plant Growth, Quality of Irrigation Water

Water requirement of crop :- Limiting soil moisture condition, Depth of irrigation water and frequency, Principal Indian Crops and their season, Crop and base period, Duty of water and delta, Factors affecting & methods of improving the duty of water, Commanded area their classification, Intensity of Irrigation, Paleo Irrigation, Kor watering, kor depth and kor period, outlet factor, capacity factor, time factor, crop ratio, overlap allowance, Consumptive use of water, factors affecting consumptive use, calculations of canal capacities.

Application of water, water management and distribution, National water policy, warabandi, rotational application.

Various Methods of Assessment of Canal Revenue

**TERM WORK:-** From each of the following groups minimum two assignments shall be performed. (At least one assignments from group 1 to 3 shall be done by using spread sheet on computer.)

**Group 1: -**

- 1) Marking catchment area on a topo-sheet and working out average annual rainfall and determining yield.
- 2) Checking for inconsistency of precipitation record by double mass curve technique.
- 3) Frequency analysis of precipitation data (plotting on semi-log graph paper )

**Group 2: -**

- 1) Development of flood hydrograph from unit hydrograph and complex storm.
- 2) Development of unit hydrograph from isolated and composite flood hydrograph.
- 3) Development of unit hydrographs of different durations use s- curve method.

**Group 3: -**

- 1) Determination of canal and reservoir capacity for water requirement of crops.
- 2) Determination of reservoir capacity from mass inflow and mass demand curve.
- 3) Benefit cost analysis of water resources project.
- 4) Determination of yield of well by recuperating test data.

**Group 4: -**

- 1) Design of drainage system in water logged area.
- 2) Design of micro – irrigation system; either sprinkler or drip irrigation system.
- 3) Design of lift- irrigation system.

#### **BOOKS RECOMMENDED –**

- Garg S.K., “Irrigation Engineering, Dams and Hydraulic Structure”, Dhanpat Rai & Sons, New Delhi
- Modi P.N., “Water Resources, Irrigation & Water Power Engineering”, Standard Publisher, New Delhi
- Punamia B.C., “Irrigation & Water Power Engineering”, Laxmi Publications, New Delhi
- Raghunath H.M., “Hydrology”, New Age Publications, New Delhi
- Raghunath H.M., “Ground Water”, New Age Publications, New Delhi
- Mutreja, “Applied Hydrology”, Tata McGraw Hill Company, New Delhi
- Arora K.R., “Irrigation Engineering”, Standard Publications, New Delhi
- P.Jayaram Reddi, “A Text Book of Hydrology”, Laxmi Publications, New Delhi
- Sharma R.K., “A Text Book of Hydrology & Water Resources”, Dhanpat Rai and Sons

## QUANTITY SURVEYING & VALUATION

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### **Teaching Scheme:**

Lectures: 4 Hours/Week  
Practical: 2 Hour/Week

### **Examination Scheme:**

Theory Paper: 100 Marks (4 Hrs)  
Term Work: 25 Marks  
Oral: 25 Marks

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### **UNIT I**

**(08 Hours, 20 marks)**

Estimate, Detailed Estimate, types of detailed estimate, purpose, data required for preparing detailed estimate, factors to be consider during preparation of detailed estimate, methods of taking out quantities, abstracting, units of measurements, building cost index, prime cost, provisional sum, centage charges, work charged Establishment, administrative approval, technical sanction.

Approximate estimate: - Importance, purposes, approximate methods of building estimating and various civil engineering works.

### **UNIT II**

**(11 Hours, 20 marks)**

Detailed estimate of buildings (load bearing and framed structure specially RCC flat roof buildings.)

Detailed estimate of community well, septic tank, pipe culvert, earthwork in roads / cannels.

### **UNIT III**

**(11 Hours, 20 marks)**

Detailed estimate of reinforcement quantities of R.C.C. elements like slab, beam, column & Isolated column footing, staircase and preparation of bar bending schedule.

### **UNIT IV**

**(10 Hours, 20 marks)**

Task work, factors affecting task work, schedule of rate, Task work of various items of construction, Analysis of rates, factors affecting cost of an item of work, material, labour etc. Analysis of various items of construction.

Specifications, purposes, types, drafting of specifications, and specifications of a few main items of civil engineering works.

### **UNIT V**

**(10 Hours, 20 marks)**

Valuation, purposes, price cost and value, factors affecting value of a property, various types of value like market value, sentimental value, mortgage, year's purchase and outgoings, legal aspects of valuation and easement act. Methods of valuation, land and building method, rental method, belting method of valuation of land. Standard rent and Standard rent fixation. depreciation, various methods of depreciation, sinking fund, book value, free hold and lease hold properties.

**TERM WORK:** - It shall consist of following

1) Units of Measurement of various items of Civil Engg. Works.

2) Approximate estimate of: -

- |  |                                      |
|--|--------------------------------------|
| i) Residential Building.               | ii) Public Building (Any Two Types). |
| iii) Elevated water service reservoir. | iv) Road and Bridge.                 |

3) Detailed estimate of a load bearing residential single story structure.

4) Detailed estimate of framed residential double story structure.

5) Detailed estimate of any two of the following:

- |                    |                  |                 |                                  |
|--------------------|------------------|-----------------|----------------------------------|
| a) Community well. | b) Pipe Culvert. | c) Septic tank. | d) Earth work in roads /cannels. |
|--------------------|------------------|-----------------|----------------------------------|

6) Detailed Specifications for any five items of construction.

7) Rate analysis for any five items for buildings.

8) Estimation of detailed quantities of reinforcement for any two of the following:

- |          |           |  |
|----------|-----------|--|
| i) Slab. | ii) Beam. | iii) Column and isolated column footing. |
|----------|-----------|--|

**BOOKS RECOMMENDED**

- a) B.N. Dutta - Estimating and Costing.
- b) M. Chatrobty - Estimating and Costing.
- c) G.S. Birdie - Estimating and Costing for Civil Engg.
- d) B.S.Patil - Estimating and Costing , Vol.I & II.
- e) S.C Rangwala - Estimating , costing and valuations.



## ENVIRONMENTAL ENGINEERING - II

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**Teaching Scheme:**

Lectures: 4 Hours/Week

Practical: 2 Hour/Week

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**Examination Scheme:**

Theory Paper: 100 Marks (3 Hrs)

Oral: 25 Marks

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**UNIT –I****(10 Hours, 20 marks)**

Definition of sewage, Necessity of sewage treatment, Requirement of a sewage management system. Composition of sewage,

Characteristics of sewage – Physical (Colour, Odour, Solids and Temperature), Chemical (Organic - Carbohydrates, Fats, Oil and Grease, Pesticides, Phenols, Proteins, Surfactants. Inorganic – Alkalinity, Chlorides, Heavy Metal, Nitrogen, pH, Phosphorous, Sulphur, Toxic Compounds, Gases – Hydrogen Sulfide, Methane, Oxygen), Biological Characteristics

Cycle of Decomposition – Anaerobic and aerobic, Nitrogen and Carbon Cycle

Tests for determining the Oxygen Demand - Biochemical Oxygen demand, (First and Second Stage BOD), Chemical Oxygen Demand, Total Oxygen Demand. Limitation of BOD test, Population Equivalent

Self Purification of Natural Stream – Dilution, Oxidation, Reduction, Sedimentation, Action of Sunlight,

Zones of Pollution – Degradation, Active decomposition, recovery, clear water

Oxygen sag analysis – Deoxygenation and reoxygenation

**UNIT –II****(10 Hours, 20 marks)**

SEWER DESIGN – Estimation of dry weather and rain water flow, hydraulic formulae, minimum and maximum velocity of flow, effect of variation in flow of sewage in velocity of flow, Forms of sewers, Design of storm water drains

CONSTRUCTION OF SEWERS – Factors affecting selection of material for sewer construction, materials & shape of sewers, Structural Loads on Sewers, Maintenance, Cleaning and ventilation of Sewers.

APPURTENANCES – Purposes and location of Inlets, catch pits, cleanouts, manholes, drop-manholes, lamp-holes, flushing devices, grease and oil traps, inverted siphons, storm water overflow devices.

**UNIT –III****(10 Hours, 20 marks)**

Preliminary & Secondary Treatment of Sewage –

Screening – Purpose, Classification, Types, Cleaning, Design Consideration & Management of screenings material

Comminutors – Purpose and types

Grit Removal – Purpose, Quality and quantity of grit, Types and Design Criteria

Grease Removal – Necessity, Skimming Tanks, Vacuum Flootation, Disposal of skimmings

Flow Equalization – Location, volume Requirement and Benefits

Sedimentation – Characteristics of settleable solids, Types of settling – (Discrete, Flocculent, Zone and Compression Settling), Classification of Settling tanks, Design criteria of settling tanks, Chemical aided settling, coagulants used

**UNIT –IV****(10 Hours, 20 marks)**

Biological Treatment of Sewage – Objective and classification

Activated Sludge Process – Process of Treatment, Operations and units, methods of aeration, Loading rate, oxygen requirement and transfer, Design consideration of aeration tank, secondary settling, operational difficulties

Sewage Filtration – Types of and basic functioning of different filters, Constructional features and design of standard trickling filter, Performance and efficiency of standard trickling filter, Troubles and remedies, Comparison of Tricking Filter Process versus ASP

Stabilization Ponds – Purpose and types of stabilization ponds and their functioning (aerobic, anaerobic and facultative ponds)

**UNIT –V**

**(10 Hours, 20 marks)**

Solid Waste Management –

Necessity of solid waste management, Types and Sources of solid waste

Properties – Sampling procedure, Determination of Physical (Individual Components, Particle size, Moisture content, Density) and chemical composition (Energy content, chemical content) of solid waste

Elements of Solid Waste Management - Materials flow in society, Reduction in raw material usage, reduction in solid waste quantities, reuse in solid waste material, material recovery, energy recovery.

Functional Element of SWM & their interrelationship –

Waste generation – factors affecting, estimation of quantities

Onsite handling, storage and processing – Municipal and industrial waste, Containers and their locations,

Collection – Collection service, Types of Collection system (Hauled Container System & Stationary Container System – Machine and manually loaded), Determination of Vehicle and Labour requirement, Collection route

Transfer and transport – Transfer stations, factors affecting design, classification (Direct, Storage and combined discharge), Requirements, Locations of Transfer stations, Transfer means and methods

Processing Techniques – Volume Reduction (mechanical, thermal) and recovery, Disposal – Land filling with solid waste – Methods and operations (area, trench method, depression land fills), Occurrence of gases and leachate in land fills

**TERM-WORK -**

The term-work shall consist of minimum seven experiments and four assignments and one technical report from the list below –

**(A) Experiments – (Minimum Seven)**

- (1) Determination of Total solid, settleable solid, dissolved solid, fixed Solid, filterable & non filterable solids, Mixed Liquor suspended solids in a sample of waste water
- (2) Determination of oil and grease in sample of sewage
- (3) Determination of BOD of sewage sample
- (4) Determination of COD of sewage sample
- (5) Determination of Sulphate / Chloride Content
- (6) Determination of Salt Content by electrical conductivity Measurement
- (7) Determination of Total Nitrogen/Different forms Nitrogen
- (8) Determination of Sulphate / Phosphate Content
- (9) General techniques of microbiology : Determination of microbial quality of water-
  - standard plate count,
  - standard coliform test,
  - determination of coliform density by MPN method
  - fecal coliform test

**(B) Assignments – (Minimum Four)**

- (1) Estimation of sewage quantity and design of sewer line
- (2) Design of Grit Chamber & Settling Tank
- (3) Design of Activated Sludge Plant / Standard Trickling Filter
- (4) Drawing of Stabilization Pond showing all details
- (5) Estimation of Overall Chemical Composition of Solid Waste
- (6) Analyzing Hauled/Stationary - Container Collection System of Solid Waste
- (7) Economic Comparison of Transport Alternative for SW

**(C) Report –**

- (1) Technical Visit Report of a Waste Water Treatment Plant or Industrial Water Treatment Plant or Solid Waste Management System/Treatment Plant

**Books Recommended –**

- Punamia & Jain, “Waste Water Engineering”, Laxmi Publications, New Delhi
- Modi P.N., “Sewage Treatment & Disposal and Waste Water Engineering”, Standard Publications, New Delhi.
- Pevy, Rowe & Tchobanoglous, “Environmental Engineering”, McGraw Hill International, New Delhi
- Garg S.K., “Sewage Disposal & Treatment & Air pollution Engineering”, Khanna Publisher, New Delhi
- Hammer & Hammer, “Water & Waste Water Engineering”, Prentice Hall International, New Delhi
- Sincero & Sincero, “Environmental Engineering – A Design Approach”, Prentice Hall International, New Delhi
- Therous, Eldridge & Mallmann, “Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage”, Agro Botanic Publisher, India
- Benerjee & Jain, “Handbook of Technical Analysis”, Jain Brothers New Delhi.
- Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli

**NORTH MAHARASHTRA UNIVERSITY JALGAON**  
**UNDER GRADUATE COURSE IN CIVIL ENGINEERING (ELECTIVE– I)**

**OPEN CHANNEL AND CONDUIT FLOW**

Lectures : - 04 Hours/ Week

Theory paper :- 100

Marks

Practical : - 02 Hours / Week

Duration :- 3 Hours

Term Works: - 25 Marks

Oral :- 25

Marks

**UNIT – I**

**(12 Lectures, 20 Marks)**

- 1) Uniform flow in trapezoidal and circular channel, calculation of normal depth and critical depth in trapezoidal and circular, the first and second hydraulic exponents, hydraulically – efficient channel section for trapezoidal and circular channel sections.
- 2) Transitions – Rectangular channel with a hump and with change in width.

**(10 Lectures, 20 Marks)**

**UNIT –II**

- 1) Gradually varies flow theory and computation for trapezoidal and rectangular Prismatic channels, differential equation of G.V.F., alternate forms, different types of G.V.F. profiles and their characteristics and examples of their occurrence, control section.

Computation of G.V.F. profiles in trapezoidal channel by standard step method, Direct Integration Methods: Ven Te Chow method & Bresse's method & Bresse's method.

**UNIT- III**

**(10 Lectures, 20 Marks)**

- 1) Rapidly varied flow due to weirs, sluice gates, end depths, hydraulic jump in rectangular channel, standing- wave flume, Parshall flume.
- 2) Unsteady flow in open channel : - Equation of continuity and equation of motion for GVUF, surges and waves in open rectangular channels – simple cases. Neglecting friction.

**UNIT – IV**

**(08 Lectures, 20 Marks)**

- 1) Pipe flow : - Three reservoir problem, pipe network. Practical design methods of rising mains and gravity mains using nomograms/ charts, economical diam. Of rising main.

**UNIT – V**

**(10 Lectures, 20 Marks)**

- 1) Unsteady flow in conduits: - Mention of types, equation of motion, establishment of flow, water hammer, celerity of pressure wave through rigid and elastic pipes, sudden and gradual and partial opening and closing of valves, details of pressure cycles.

- 2) Surge tanks : - Necessity, location, function, types, analysis of simple cylindrical surge tank considering frictional effects.

**TERM WORK:** - Any six of following assignment should be performed

- 1) Calculation of normal depth & critical depth in trapezoidal / circular channel using graphs/ tables.
- 2) Example on transition in rectangular channel
- 3) Computation of G.V.F. profile in trapezoidal channel by standard step method or by Ven Te Chow method.
- 4) Developing and running computer programming for numerical method for obtaining G.V.F. profile.
- 5) Calculation of hydraulic jump in open rectangular channel.

- 6) Calculation of surges in open rectangular channel.
- 7) Design of gravity/rising main (Dead end system in case of gravity mains).
- 8) Calculation of water hammer pressures.
- 9) Design of simple cylindrical surge tank.

**ORAL EXAM:** - Based on above term work.

**Book Recommended: -**

1. Flow in open channels:- Dr.K.Subramanya.  
Tata McGraw – Hill publishing company Ltd. New Delhi.
2. Fluid Mechanics:- V.L Streeter and E.B. Wylie.  
Tata McGraw- Hill publishing company Ltd. New Delhi.
3. Fluid Mechanics: - Dr. A.K. Jain.  
Khanna Publishers, Dhelhi.
4. Theory and Application of Fluid Mechanics:- Dr. K. Subramanya.  
Tata McGraw – Hill publishing company Ltd. New Delhi.
5. Water power Engg.:- M.M. Dandekar and K.N. Sharma  
Vikas Publishing House, Pvt. Ltd. Delhi.
6. Open Channel Hydraulics:- Ven Te Chow.  
Tata McGraw – Hill Publishing Company, Ltd. New Delhi.

## WATERSHED MANAGEMENT

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Lectures : - 04 Hours/ Week

Theory paper :- 100

Marks

Practical : - 02 Hours / Week

Duration :- 3 Hours

Term Works: - 25 Marks

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### **UNIT - I**

Concept of Watershed. Significance of watershed based development, Watershed characteristics – geomorphology and hydrology. Drainage basin, network and channel morphology.

### **UNIT- II**

Watershed Hydrology - Hydrologic cycle, water balance, climate and precipitation, soils and infiltration, interception and evapotranspiration, groundwater, streamflow and runoff, water quality, aquatic ecosystems (eutrophication, habitat disturbance, etc).

### **UNIT- III**

Watershed resource appraisal – Physical, hydrological, land use/cover. Land Capability Classification.

Watershed Management and Planning – objectives

### **UNIT- IV**

Issues in water resources - Point source pollution, agricultural and urban non-point source pollution, erosion, water scarcity, flooding, drinking water protection, wastewater treatment and septic systems

Soil and water conservation measures

Watershed Program – Benefit-Cost Analysis

### **UNIT- V**

Urban Watershed Management – Wet weather flow, Infrastructure Integrity Testing, Effect of discharge to receiving water, Green Roof, Rain water harvesting from urban structures, Urban watershed management – goals & strategies, Sustainability & UWSM, urban stormwater-pollution-abatement technologies and sediment management, Source Loading And Management Model

### **List of Practical/Term work Assignments -**

(Minimum six practicals /Assignments shall be performed)

1. Mapping and demarcation of watershed
2. Morphometric analysis of watershed
3. Areal Precipitation – Thiessen Polygon, Isohyetal methods. Analysis and interpretation of rainfall data.
4. Water balance estimation
5. Estimation of Runoff and streamflow. Flow duration curve, return period. Analysis and interpretation of streamflow data
6. Groundwater contouring and interpretation regarding movement and flow direction
7. Land capability classification

8. Soil loss estimation
9. Visit to a Watershed and submission of report

**Text / Reference Books -**

1. Murthy, J. V. S. (1994). Watershed Management in India. Wiley Eastern Ltd., New Delhi.
2. Pranjape, S. and Others. (1998). Watershed-based Development, Bharat Gyan Vigyan Samithi, New Delhi.
3. Mutreja, K. N. (1990). Applied Hydrology, Tata McGraw-Hill Pub. Co. Ltd. New Delhi.
4. Singh R. J. (2000): Watershed Planning and Management, Yash Publishing House, Bikaner.

## FINITE ELEMENT METHOD

Lectures : - 04 Hours/ Week  
TW/PR : - 02 Hours / Week  
Term Works: - 25 Marks

Theory paper : 100 Marks  
Duration : 3 Hours  
Oral : 25 Marks

### **UNIT I.**

Concept of Finite element, Classification of element for discrete and continuum structure , characteristics of an element, Displacement function , General approach for formulation of the problem , Degree of freedom , Assembly rules and boundary conditions. Gradient and divergence theorem.

Matrix's algebra, concept of local and global , coordinates, Rules of transformation of stiffness matrix from local to global axes, Variation methods of Approximations.

Approximation errors in F.E.M. various measures of errors, accuracy of solution.

Advantages and disadvantages of F.E.M.

### **UNIT - II.**

Discretization of the domain into elements, shape function, "Pascal triangle", Selection for the order of polynomial, convergence requirements, inter element compatibility conforming and non conforming element, concept of band width. Principle of minimum potential energy, Rayleighrit method, The method of weight residuals, Saint Vasant Principal. Application of above method to civil engineering fields.

### **UNIT - III.**

One dimensional second order and fourth order equations, Lumped and work equivalent load, Theory of work equivalent load, Shape function for one dimensional analysis, Derivation of element equations.

Analysis of one dimensional structure (beam, coloumn etc.) by F.E.M. with different loading and boundary conditions.

### **UNIT – IV.**

Finite element method for two dimensional problems, second order equation involving scalar-valued function, Two dimensional finite elements and interpolation function.

Direct method for determination of stiffness matrix for plane truss, continuous beams and plane frame elements, solution for displacement unknowns and analysis.

### **UNIT – V.**

Triangular and Rectangular elements for plane stress/strain conditions, effect of element aspect ratio, finite representation of infinite mass.



Formulation of stiffness matrix for slabs using triangular or rectangular elements with different boundary condition.

Introduction of Isoparametric 1 D and 2 D elements, shape function and natural coordinate system, quadrilateral isoparametric elements for plane stress/ strain conditions.

**TEXT BOOKS:-**

1) The finite element method (fourth edition) Vol – I & II.

By O.C. Zienkiewicz & R.L. Taylor.

2) An introduction to the finite element method.

By J.N. Reddy.

3) Introduction to the finite element method.

By C.S. Desai and J.F. Abel.

4) Rudiments of finite element method.

By V.K. Manikar Selvam, Dhanpat Rai Pub.

5) Finite element primer.

By V.K. Manikar Selvam, Dhanpat Rai Pub.

**NORTH MAHARASHTRA UNIVERSITY JALGAON**  
**B.E. (CIVIL)**

**W.E.F : 2008- 09**

**TERM - I**  
**SEMINAR**

**Teaching scheme:**  
**Practical: 2 hrs / week**

**Examination scheme:**  
**Term Work : 25 Marks**

1. For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
3. A typed report should be submitted in paper bound copy.
  - a. Size of report depends on advancement of topic.

**4. ASSESSMENT OF SEMINAR for TERM WORK**

Title of seminar: \_\_\_\_\_

Name of guide : \_\_\_\_\_

| Sr. No. | Exam Seat No. | Name of Student | Assessment by examiners |                   |                |                        |              | Grand Total |
|---------|---------------|-----------------|-------------------------|-------------------|----------------|------------------------|--------------|-------------|
|         |               |                 | Topic Selection         | Literature Survey | Report Writing | Depth of understanding | Presentation |             |
|         |               |                 | 5                       | 5                 | 5              | 5                      | 5            | 25          |
|         |               |                 |                         |                   |                |                        |              |             |

5. Assessment of Literature survey will be based on
  - a. Collection of material regarding history of the topic.
  - b. Implementation.
  - c. Recent applications.
6. Assessment of Depth of understanding will be based on
  - a. Questioning by examiners.
  - b. Questioning by students.
  - c. What the student understands i.e. conclusion regarding seminar.
7. Assessment of presentation will be based on;
  - a. Presentation time (10 minutes)
  - b. Presentation covered (full or partial)
  - c. Way of presentation
  - d. Questioning and answering (5 minutes)
8. Examiners should be a panel of two one of them must be guide.

**NORTH MAHARASHTRA UNIVERSITY JALGAON**  
**B.E. (CIVIL)**

**W.E.F : 2008- 09**

**TERM - I**  
**PROJECT I**

**Teaching scheme:**  
**Practicals: 2 hrs / week**

**Examination scheme:**  
**Oral : 25 Marks**  
**Term Work : 25 Marks**

1. Every student individually or in a group shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.
2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become  $12*2 + 12*4 = 72$  Hrs per project partner). The final title of the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester.
3. The guides should regularly monitor the progress of the project work.
4. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT \_\_\_\_\_  
NAME OF THE GUIDE: \_\_\_\_\_

| Sr No | Exam Seat No | Name Of Student<br>Marks | Assessment by guide (70%) |                 |               |            |       | Assessment by Departmental committee (30%) |                    |       | Grand Total | Out of 25 Marks |
|-------|--------------|--------------------------|---------------------------|-----------------|---------------|------------|-------|--|--------------------|-------|-------------|-----------------|
|       |              |                          | Literature survey         | Topic Selection | Documentation | Attendance | Total | Evaluation (10%)                           | Presentation (20%) | Total |             |                 |
|       |              |                          | 10                        | 05              | 15            | 05         | 35    | 05   | 10                 | 15    |             |                 |
|       |              |                          |                           |                 |               |            |       |  |                    |       |             |                 |
|       |              |                          |                           |                 |               |            |       |  |                    |       |             |                 |
|       |              |                          |                           |                 |               |            |       |  |                    |       |             |                 |

Sign of Guide

Sign. of Committee Members

Sign. of H. O. D.

5. The guide should be internal examiner for oral examination.
6. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
7. The evaluation at final oral examination should be done jointly by the internal and external examiners.

**SYLLABUS OF FOURTH YEAR (CIVIL)**  
**TERM-II<sup>ND</sup> (w.e.f. 2008-09)**  
**STRUCTURAL DESIGN AND DRAWING-III**

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**Teaching Scheme:**

Lectures: 4 Hours/Week

Practical: 4 Hour/Week

**Examination Scheme:**

Theory Paper: 100 Marks (4 Hrs)

Term Work: 25 Marks

Oral: 25 Marks

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**UNIT I**

**( 12 Hours, 25 marks )**

**R.C. STRUCTURES**

- i) Ductile detailing of RC members as per Is 13920.
- ii) Design of rectangular combined footing.
- iii) Design of flat slabs.

**UNIT II**

**( 12 Hours, 25 marks )**

- i) Design of cantilever retaining wall.
- ii) Design of circular water tanks resting on ground.

**UNIT III**

**( 12 Hours, 25 marks )**

**PRESTRESSED CONCRETE STRUCTURES**

- a) Introduction :- Basic concept, materials, prestressing systems, stages of loading, stresses in tendons.
- b) Losses in prestresses :- Nature of losses, loss due to classic shortening of concrete, successive prestressing of straight cables, relaxation of stress in steel friction in a curved cable anchorage.
- c) Design of one way and two way prestressed concrete slabs.

**UNIT IV**

**( 12 Hours, 25 marks )**

- a) Transfer of prestres in pretensioned members, transmission length, end zone reinforcements. Anchorage Zone stresses in post –tensioned members – Guyan’s method.
- b) Limit state design of prestressed concrete members philosophy of design, various criteria for limit. States, design loads, strength and serviceability.
- c) Design of pretensioned and post tensioned flexural members – Rectangular and flanged sections, cable profile, Design of shear reinforcement, bond partial prestressing limit state method.

**TERM WORK:-** It shall be based on above syllabus and will consist of

- i) At least three numbers of imperial size sheets based on prestressed & R.C. structures.
- ii) Demonstration of computer softwares for design of structures.
- iii) Report on site visit to at least one structure based on above syllabus

**TEXT BOOKS:-**

- 1) N. Krishnaraju - Prestressed Concrete
- 2) S.R. Karve & V. L. Shah- ‘Limit State Analysis & Design of Reinforced Concrete’, Structures PublicatinsR.C.C. Structures.
- 3) Punmia, Jain & Jain – ‘Comprehensive R.C.C. Design’, Laxmi Publications.
- 4) S. K. Duggal – ‘Earthquake Resistant Design of Structures’, Oxford University Press.
- 5) N. C. Sinha & S. K. Roy – ‘Fundamentals of Reinforced Concrete’,

## CONSTRUCTION MANAGEMENT –II

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**Teaching Scheme:**

Lectures: 4 Hours/Week  
Tutorial: 2 Hour/Week

**Examination Scheme:**

Theory Paper: 100 Marks (3 Hrs)  
Term Work: 25 Marks  
Oral: 25 Marks

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**UNIT –I****(10 Hours, 20 marks)**

- A) Important Acts and Laws related to Constructions Industry- Factory act, The Employees Provident Fund Act, Minimum wage Act, Workman Compensation Act, Industrial Dispute Act, Indian Trade Union Act, arbitration act, employees state insurance act.
- B) Safety in Construction : Causes of accidents, Classification costs of accident, measurements of accidents ,Injury frequency rate, injury severity rate, injury index, safety programme, accident report,  
Safety measures in handling of building materials, construction of elements of building, demolition of buildings, hot bituminous works, scaffolding, formwork and other equipments, excavation.

**UNIT–II****(10 Hours, 20 marks)**

Materials management , its aims and functions, inventory analysis , inventory models, ABC analysis, inventory management, buffer stock, lead time, EOQ.  
Material requirement, planning , market research, system of purchase of materials, stock of material at site , MAS account, working capital management.  
Supervision and quality control, concept of quality, stages of control , measures of control, organization for control, quality control management, sample and sampling technique, inspection, introduction to ISO 9000 and ISO 14000.

**UNIT—III****(10 Hours, 20 marks)**

Contract, essentials, types, registration and law of contract, free consent, contract documents , performance of contract, breach of contract, advances to contractor, bills of contract and payments , subletting , inspection of works, tender, tender notice ,various terms used in tender notice such as SD, EMD, estimated cost, Time period of work ,cost of tender form, invitation of tender, time schedule of calling tender, tender documents two envelopes system, scrutiny and acceptance , revocation of tender , extra items , additions and alterations , defect liability , liquidated and unliquidated damages , escalation of rates, work order.

**UNIT IV****(10 Hours, 20 marks)**

Excavating & Hauling Equipments :-

- a) Power shovels; size, basic parts, selection ,factors affecting output.
- b) Draglines:- types, size, basic parts, effect of job and management conditions on the out put of dragline.
- c) Clamshells – clamshell buckets
- d) Hoes- basic parts working ranges
- e) Bulldozers-types, moving earth with bull dozers.

**UNIT –V****(10 Hours, 20 marks)**

- a) Compacting Equipments:-

Types of compacting equipments. Such as tamping rollers, smooth wheel rollers, pneumatic tyred rollers,

- b) Hoisting equipments :Chain, hoist, fork trucks

Cranes : Classification, derrick crane, mobile crane, Tower crane, Hydraulic crane, overhead or gantry crane.

Safety in crane operation  
Use of cranes in steel construction  
Use of cranes in concrete construction

**TERM WORK** : Term work shall consist of assignments based on each unit of the above syllabus

**BOOK RECOMMENDED**

- 1) R.L.Peurifoy - Construction planning ,Equipments and Methods.
- 2) Dr. Mahesh Verma - Construction equipments and its planning and application
- 3) Dr.U.K. Shrivastava - Construction planning and Management
- 4) Dr. S.V. Deodhar - Construction equipment and planning
- 5) Sengupta - Construction Management and planning.
- 6) Chitkara - Construction Project Management
- 7) B.N.Dutta - Estimating and Costing
- 8) M.Chakroborty - Estimating and Costing
- 9) S.C.Rangwala - Estimating and Costing
- 10) B.S.Patil - Estimating and Costing -Vol-1& 2.

## WATER RESOURCES ENGINEERING - II

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### **Teaching Scheme:**

Lectures: 4 Hours/Week  
Practical: 2 Hour/Week

### **Examination Scheme:**

Theory Paper: 100 Marks (3 Hrs)  
Term Work: 25 Marks  
Oral: 25 Marks

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### **UNIT I**

**(11 Hrs., 20 marks)**

1. Dams: - Introduction, types of dams, selection of site for dam, choice of a dam, economical height of dam.
2. Gravity dams: - Introduction, forces acting on dam, elementary and practical profile, modes of failure and stability analysis and design of gravity dam, low and high dam. Construction and materials of construction, control of cracking, galleries, Joints and keys.

### **UNIT II**

**(09 Hrs., 20 marks)**

1. Introduction to arch dams (only elementary)
2. Spillways: - Introduction, spillway capacity, different types of spillways: their construction and suitability, design principles of Ogee spillway and siphon spillway.
3. Energy dissipation below spillway, types of hydraulic jump, jump height curves and tail water rating curves, various types of energy dissipators: Indian Standard stilling basins and buckets.
4. Gates: - Various types of spillway crest gates and their uses.

### **UNIT III**

**(10 Hrs., 20 marks)**

1. Earth dams :- Introduction, types ,elements of earth dam, basic design considerations, causes of failures, piping and its prevention, control of seepage, drainage in earth dams, phreatic line, stability of U/S and D/S slopes under various situations, introduction to rock-fill dam.
2. Diversion headworks :- Introduction, selection of site, types of weirs and barrages, layout of diversion headwork and its components and functions, causes of failures of weirs on permeable foundations and remedies, Hydraulic design of weir w.r.t. subsurface flow, safety against piping and uplift, Bligh's, Lane' s and Khosla' theories.

### **UNIT IV**

**(10 Hrs., 20 marks)**

Canal irrigation :- Types of canals, canal alignment.

Design of c/s of unlined stable channels in alluvium: Kennedy's and Lacey's theory and their merits and demerits.

Preliminary sediment transport theory, critical tractive force, suspended and bed loads.

Design of c/s of unlined channels in alluvial soil according to IS 7112 – 1973 : Lacey's method and tractive force approach.

Design procedure for L – section for an irrigation canal, balancing depth, losses in canals, schedule of area statistics and channel dimensions, Garret's and Lacey's diagrams.

Lining of irrigation canals, advantages of lining, economics of linings, types of linings. Design of lined Channel, land drainage, discharge and spacing of closed drain.

### **UNIT V**

**(08 Hrs., 20 marks)**

1. Canal Masonry Works:- Cross drainage works: necessity, types, selection, comparative merits and demerits. Various types of falls: introduction and necessity (no mathematical treatment for any of above structures)

2. River training works:- necessity and types of river training works and bank protection and their construction details. (No mathematical treatment)
3. Hydropower: - general features of hydropower development, advantages of hydropower, types of hydropower plants and their layouts, assessments of power potential, load factor, capacity factor, diversity factor.

### **TERM WORK**

Minimum six out of following assignments should be performed:-

1. Stability analysis of a gravity dam.
2. Stability analysis of slope of earth dam.
3. Design of Ogee spillway with energy dissipator
4. Analysis of weir on permeable foundation by using Khosla's charts.
5. Design of unlined canal in alluvium by using Garret;s /Lacey 's diagrams ( at least three sections along the alignment.) and plotting L-section, also preparing schedule of area statistics and Channel dimensions.
6. Any one of the following :
  1. Analysis and layout and section of any one type of cross drainage work or fall or regulator .
  2. Any one type of river training work.
  3. A typical layout of high head hydropower plant and functions of components.
7. Report based on visit to any dam or hydropower plant.
8. Benefit - cost analysis of a water resources engineering project.

**ORAL EXAM:-** Based on the above T.W.

**Imp. Note:-** Following charts should be provided to students of B.E. (civil) during theory paper.

- i) Dr. A.N. Khosla's curves for design of weir on permeable foundation.
- ii) Gaarret's & Lacey's diagrams for design of canals

### **BOOKS RECOMMENDED:-**

- Dr. P.N. Modi, Standard Book House , Delhi. - Irrigation, Water Resources and Water Power Engg.
- S.K.Garg - Irrigation Engg. and Hydraulic Structures .
- Dr. B.C.Punmia - Irrigation Engg. and Water Power Engg..
- Varshney ,Gupta, Gupta -Theory and design of Irrigation structures, Volume I and II .
- Bharat Singh - Irrigation Engg.
- K.B.Khushlani - Irrigation Engg. .
- Justin , Hinds - Irrigation Engg. and Practice



**NORTH MAHARASHTRA UNIVERSITY JALGAON**  
**UNDER GRADUATE COURSE IN CIVIL ENGINEERING (ELECTIVE– II)**

**WATER POWER ENGINEERING**

Lectures : - 04 Hours/ Week  
Practicals : - 02 Hours / Week  
Term Works: - 25 Marks

Theory paper :- 100 Marks  
Duration :- 3 Hours

**UNIT - I**

General – Conventional Source of Energy, Status of Electrical Power in the World and India, Advantages and dis-advantages of hydro-electric power over other conventional sources, Place of hydropower in the power system, Investigation and studies for hydro power development.

Estimation of Water Power Potential – Mass Curve, Flow Duration Curve, Firm Power & Secondary Power, Power Duration Curve (Available Power)

Power Plant Economics – Types, Factors affecting outline design, Useful Life, Connected Load, Maximum Demand, Demand Factor, Load Factor, Load Curve, Base & Peak Load, Plant Capacity Factor, Plant Use Factor, Diversity Factor, , Economic Load Sharing between Base Load & Peak Load Power Stations., Cost of Electrical Energy, Energy Rates (Tariff)

**UNIT- II**

Classification of Hydro-electric Power Plants – Run-Of -River Plant, Valley Dam Plant, Diversion Canal Plant, High Head Diversion Plant – General Arrangements & Different Layouts

Storage and Pondage, Pondage Factor

Pumped Storage Plants – Essential Requirements, Necessity, Advantages, Classification of PSP development, Relative Merits of Different Arrangements, Problems in Operation, Layout & Economics

Tidal Power Plants - Principles of power generation - components of power plant – Single and two basin systems – Turbines for tidal power - Estimation of energy – Maximum and minimum power ranges

**UNIT- III**

Surface Power Stations – Structure, Dimensions, Lighting & Ventilation, Variations in design  
Underground Power Station – Location, Types of Layout, Components, Advantages

Penstock & Accessories – Classification, Design Criteria, Economical Diameter, Anchor Blocks, Conduit Valves, Bends & Manifolds Water Hammer & Surges in Penstocks – Phenomenon, Resonance, Surge Tanks Intakes – Types, Losses, Air Entrainment, Inlet Aeration

**UNIT- IV**

NON CONVENTIONAL ENERGY -

Biomass energy - Bio fuel classification – Examples of thermo chemical, Pyrolysis, biochemical and agrochemical systems – Energy farming – Direct combustion for heat – process heat and electricity – Ethanol production and use – Anaerobic digestion for biogas – Different digesters – Digester sizing – Applications of Biogas

Solar Energy - Availability - Solar radiation data and measurement - Estimation of average solar radiation - Solar water heater types - Heat balance – Flat plate collector efficiency – Efficiency of heat removal - Thermo siphon flow calculation - Forced circulation calculation - Evacuated collectors - Basics of solar concentrators Solar Energy Applications - Solar air

heaters – Solar Chimney - Crop driers - Passive solar system - Active solar systems - Water desalination - Output from solar still – Principle of solar ponds.

#### **UNIT- V**

Wind Energy – Nature of wind – Characteristics – Variation with height and time – Power in wind – Aerodynamics of Wind turbine – Momentum theory – Basics of aerodynamics – Aerofoils and their characteristics – HAWT – Blade element theory – Prandtl's lifting line theory (prescribed wake analysis) VAWT aerodynamics – Wind turbine loads – Aerodynamic loads in steady operation – Yawed operation and tower shadow.

Wind Energy Conversion System – Siting – Rotor selection – Annual energy output – Horizontal axis wind turbine (HAWT) – Vertical axis wind turbine (VAWT) – Rotor design considerations – Number of blades – Solidity - Blade profile – Upwind/Downwind – Yaw system – Tower – Braking system - Synchronous and asynchronous generators and loads – Integration of wind energy converters to electrical networks – Inverters – Control system – Requirement and strategies – Noise – Applications of wind energy

#### **Term Work - Assignment –**

The term work shall consist of eight assignments, which should include minimum one assignment from each unit.

The term work shall include a visit report on Hydroelectric Power Station and Wind Farm.

#### **References:**

1. Water Power Engineering / M. M. Dandekar & K. N. Sharma
2. A text Book of Water Power Engineering / R.K.Sharma & T.K.Sharma
3. Renewable Energy Resources / John Twidell and Tony Weir / E & F.N.Spon
4. Solar Energy - Principles of thermal collection and storage/ S.P. Sukhatme / TMH
5. Solar Heating and Cooling / Kreith & Kreider

Wind Energy Handbook / Tony Burton, David Sharpe, Nick Jenkins and Ervin Bossanyi / Wiley  
Wind Electrical Systems / S.N.Bhadra, D.Kastha and S.Banerjee / Oxford

## GEOGRAPHICAL INFORMATION SYSTEM (GIS)

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Lectures : - 04 Hours/ Week

Theory paper :- 100 Marks

Practical : - 02 Hours / Week

Duration :- 3 Hours

Term Works: - 25 Marks

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### **UNIT - I**

Introduction to GIS – Definition, Sources & types of data, Concept of Space and Time, Spatial Information Theory, History of GIS, Objectives, Elements, Hardware & Software requirements and applications of GIS

Data Models of Spatial Information – Layers and Coverages, Conceptual model, Object based network and field model,

Representation of SDM in computer – Raster & Vector models, Comparison

Data Models of Non-Spatial Information – Database Management Systems, Hierarchical Structures, Network Structures, Relational Structures

### **UNIT- II**

Digitizing Editing and Structuring of Map Data – Digitizing manual, semi-automatic

Editing – Error detection and correction

Tolerances – TIC Match, Fuzzy, Node Snap, Arc Snap, Weed, Grain Tolerance

Topology creation, Attribute Map Generation

Digital Elevation Model – Needs of DEM, Various Structures of DEM- Line, TIN, Grid, Products derived from DEM

### **UNIT- III**

Spatial Data Analysis –

General – Attribute query, and spatial query, Single and Multi-layer operations, Spatial modeling, Network and surface analysis

Vector based spatial data analysis – Topographical overlays, logical operators, conditional operators, proximity operators.

Raster based spatial data analysis – Local functions, focal functions, zonal functions, global functions, area numbering, cost surface analysis, optimal path analysis, proximity search

### **UNIT- IV**

Use of GIS for Water Resources and Management – Water Resources Potential Estimation, Analysis & Estimation of Sediment in Reservoirs, Water Supply Systems Planning and Management, Waste Water Planning and Management, Role of Remote Sensing and GIS in Ground Water exploration, Use of GIS for Watershed Planning and management

### **UNIT- V**

LAND RESOURCES: Land evaluation and suitability studies by Remote Sensing and GIS. Techniques of Landuse/Land cover map preparation. Landuse/ Landcover mapping and planning.

Municipal GIS - Landuse - Statistics as a basis for Environmental Planning, Solid and Hazardous waste disposal site selection.

Use of GIS for Agricultural Practices and Management

### **List of Practical / Term work Assignments –**

The term work shall consist of any six practical/ assignments.

1. Data quality and sources of errors
  - i) Nature of sources of geographical data

- ii) Sources of errors in GIS database
- iii) Data quality parameters
- 2. Map scale and projections
  - i) Information on various scales
  - ii) Need of projection
  - iii) Spherical co-ordinate system
  - iv) Properties of map projections
- 3. Preparation of vector database and maps: manual method for point line and area entities.
- 4. Preparation of a raster database and map: manual method for point line and area entities.
- 5. Measurement of distance between two points for vector and raster data.
- 6. Measurement of area - vector and raster data.
  - i) Image enhancement
  - ii) Filtering - Low Frequency
  - iii) Linear edge enhancement
  - iv) Band rationing
  - v) Ground truth data collection
- 7. GIS operations
  - i) Overlay Analysis
  - ii) Buffer Analysis
  - iii) Map Algebra
  - iv) Multicriteria and Query Analysis
  - v) GPS

**Text / Reference Books -**

1. Burroughs, P. A (1986): Principles of Geographical Information Systems for land Resources Assessment, Oxford University Press
2. Environmental Systems Research Institute (1993): Understanding GIS: The Arc Info method
3. Training Course for GIS for resource management and development planning: Lecture notes, V1: GIS Fundamentals and Techniques, Government of India
4. Bernhardsen, Tor (1999): Geographic Information Systems: An Introduction, John Wiley and Sons
5. Clarke, Keith C. (1999): Getting Started with Geographic Information Systems, Prentice Hall
6. Demers, Michael N. (2000): Fundamentals of Geographic Information Systems, John Wiley
7. Haywood, Ian (2000): Geographical Information Systems, Longman
8. Chang, Kang-taung (2002): Introduction to Geographic Information Systems, Tata McGraw-Hill
9. Williams, Jonathan (1995): Geographic Information from Space: Processing and Applications of Geocoded Satellite Images, John Wiley and Sons

10. Geographic information Systems by Jeffery star, John Estes Prentice Hall 2004.
11. Fundamental of Geographic Information Systems -Demers 2001 Edition.
12. Geographic Information Systems: An Introduction, [By Tor Bernhardsen, Jhon Wiley and Sons, 2005](#)
13. Remote Sensing and Image Interpretation by T.M.Lillesand and R.W.Kiefer, John Wiley, Third Edition, 2005
14. GIS Applications for Water, Wastewater, and Stormwater Systems, [U.M. Shamsi](#), A CRC Press Book, 2004

## INDUSTRIAL WATER POLLUTION CONTROL

Lectures : - 04 Hours/ Week  
Practical : - 02 Hours / Week  
Term Works: - 25 Marks

Theory paper :- 100 Marks  
Duration :- 3 Hours

### **UNIT - I**

Sources and Characteristics of Industrial water – Source and characteristics of waste water, Industrial waste survey, In-plant waste control and water reuse, Estimation of organic contents, Measurement of effluent toxicity.

Different water quality requirements of various industries for different pressure boiler feed waters, cooling water and process water. Waste generation and characterization from different industries like paper and pulp, breweries and distilleries, tanneries, textile, dairy, fertilizer, sugar mill, steel, oil refinery, petrochemical and pharmaceutical industries.

Pre & Primary Treatment – Equalization, Neutralization, Sedimentation, Oil separation, Sour water strippers, Floatation, Coagulation, Precipitation and Heavy Metal Removal

### **UNIT- II**

Aeration and Mass Transfer – Mechanism, Equipment, Air Stripping of VOC.

Aerobic Biological Oxidation – Mechanism of Organic Removal,, Bio-oxidation mechanism, Sludge Quality Consideration, Soluble Microbial Product formation, Bio inhibition of ASP, Nitrification and De-nitrification, Development of Process Design Criteria

Biological WW Treatment Process – Lagoons and Stabilization basins, Aerated Lagoons, Activated Sludge Process, Tricking Filtration, Anaerobic Decomposition, Rotating Biological Contractor, Evaluation of Anaerobic Treatment

### **UNIT- III**

Adsorption – Theory of Adsorption, Properties of activated carbon, The PACT process

Ion Exchange – Theory of Ion Exchange, Plating Waste Treatment

Chemical Oxidation – Introduction to stereochemistry and applicability, Hydro thermal process

Sludge Handling & Disposal – Characteristics of Sludge for disposal, Aerobic digestion, Gravity thickening, Floatation thickening, Gravity belt thickener, Centrifuge – Disk, Basket,

Filtration – Vacuum, Pressure

Sand Bed Drying, Land disposal of sludge, Incineration

### **UNIT- IV**

Air Pollution – Definition of Air Pollution, Definition of Air Pollutants, Measurement of Air Pollution, Classification of Air Pollutants, Primary and Secondary Air Pollutants, Properties of major air pollutants,

Effects of Air Pollutants on Man, Vegetation, Animals and Materials

Meteorology and Plume Dispersion – Atmosphere, Zones of Atmosphere, Scale of Meteorology and different meteorological parameters affecting pollutant's dispersion in atmosphere, Temperature Lapse Rate, Plume behavior, Gaussian Plume Model, Plume Rise in Atmosphere, Different formulae for estimation of stack height.

### **UNIT- V**

Global Effects of Air Pollution – Green House Effect, Effects of Particulate on earth-atmosphere heat balance, Heat Islands, Acid rains and Ozone holes

Air Pollution Control – Atmospheric Cleansing Process, Approaches to Contaminant Control, Control Devices for Particulate Contaminants – Gravitational Settling Chambers, Centrifuge Collectors, Wet Collectors, Bag house filters & Electrostatic Precipitators  
Control Devices for Gaseous Contaminants – Adsorption, Absorption, Condensation, Combustion, Automotive Emission Control

Practical & Term Work - Assignment –  
(Total 12 = 7 Experiments + 3 Assignments)

**GROUP – A “Experiments”** - (Minimum Seven Practical should be performed – (4 from Water Pollution Monitoring and 3 from Air Pollution Monitoring)

**WATER POLLUTION MONITORING** - Estimation of -

- i) Hardness by EDTA Method
- ii) Ammonia/Nitrogen
- iii) Nitrite/Nitrogen
- iv) Estimation of phosphates
- v) Sulfate by Spectrophotometric & Turbidimetric Method
- vi) Biological Oxygen Demand
- vii) Chemical Oxygen Demand
- viii) Fluorides by SPADNS Reagent
- ix) Heavy metals by AAS
- x) Pesticide Residue Estimation

**AIR POLLUTION MONITORING** : Estimation of -

- i) NO<sub>x</sub>
- ii) SO<sub>x</sub>
- iii) Particulate matter
- iv) Hydrocarbon

**GROUP – B “Assignments”** - (Minimum three assignments)

1. Determination of Concentration of Air Pollutants by using the Air Pollution Dispersion Models
2. Design of Height of Stacks
3. Design Problems on Air Pollution Control Equipments

**References:**

1. Pevy et al Environmental Engineering, McGraw Hill International, New Delhi, 2004,
2. W.Wesley Eckenfelder, Industrial Water Pollution Control, McGraw Hill International Edition, 2003
3. Sincero & Sincero, Environmental Engineering – A Design Approach, Prentice Hall India, 2002
4. Sewage Disposal and Air Pollution Engineering, Khanna Publisher, New Delhi, 2004
5. Goel PK, Water Pollution – Causes, Effects and Control, New Age Publications, New Delhi 2001
6. Waste Water Treatment , M.N.Rao and A.K. Dutta, 1987, Oxford & IBH Pub.Co.
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**NORTH MAHARASHTRA UNIVERSITY JALGAON  
B.E. (CIVIL)**

**W.E.F : 2008- 09**

**TERM - II  
SITE VISIT / CASE STUDY**

**Teaching scheme:  
NIL**

**Examination scheme:  
Term Work : 25 Marks**

**EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION**

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two construction sites / industries arranged by college and accompanied by teachers. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.
2. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.
3. The report should contain information about the following points:
  - (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
  - (b) The project / industry brief description with sketches and salient technical information.
  - (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
  - (d) Suggestions (if any) for improvement in the working of those organizations.
4. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal.



**NORTH MAHARASHTRA UNIVERSITY JALGAON**

**B.E. (CIVIL)**

**W.E.F : 2008- 09**

**TERM - II  
PROJECT II**

**Teaching scheme:  
Practicals: 4 hrs / week**

**Examination scheme:  
Oral : 50 Marks  
Term Work :100 Marks**

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project in all respect .
2. The guides should regularly monitor the progress of the project work.
3. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term
4. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

**B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM )**

NAME OF THE PROJECT: \_\_\_\_\_

NAME OF THE GUIDE: \_\_\_\_\_

| Sr. No | Exam. Seat No | Name Of Students | Assessment by guide (70%)           |                       |                |                       |               |       | Assessment by department (30%) |                     |       | Grand Total |
|--------|---------------|------------------|-------------------------------------|-----------------------|----------------|-----------------------|---------------|-------|--------------------------------|---------------------|-------|-------------|
|        |               |                  | Fabrication /software / actual work | Executio n of project | Project report | Scope/ Cost / Utility | Attende- nece | Total | Evalu ation (10%)              | Prese- ntaion (20%) | Total |             |
|        |               | Marks            | 20                                  | 10                    | 20             | 10                    | 10            | 70    | 10                             | 20                  | 30    | 100         |
|        |               |                  |                                     |                       |                |                       |               |       |                                |                     |       |             |
|        |               |                  |                                     |                       |                |                       |               |       |                                |                     |       |             |

Sign of Guide

Sign. of Committee Members

Sign. of H. O. D.

7. The guide should be internal examiner for oral examination.
8. The external examiner should be from the related area of the concerned project.
9. The evaluation at final oral examination should be done jointly by the internal and external examiners.