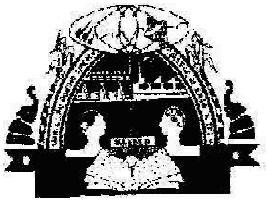

# SYLLABUS

## Final Year B.Tech (Civil & Water Management Engineering)

## (2012 – 2013)

**DEPARTMENT OF CIVIL & WATER MANAGEMENT ENGINEERING**
**S.G.G.S. INSTITUTE OF ENGINEERING & TECHNOLOGY**
**VISHNUPURI, NANDED-431606, MS.**

# S.G.G.S. INSTITUTE OF ENGINEERING & TECHNOLOGY

**DEPARTMENT OF CIVIL & WATER MANAGEMENT ENGINEERING**

## TEACHING AND EXAMINATION SCHEME
## Final Year B.Tech. ( Civil & Water Management Engineering)

| Course Code | Name of the Course | Lectures Hrs/week | Tutorial Hrs/week | Practical Hrs/week | Total No. Credits |
|---|---|---|---|---|---|
| SEMESTER-I | | | | | |
| CW401 | Irrigation Water Management Engineering-II | 02 | -- | -- | 02 |
| CW402 | Project Planning and Management | 03 | 01 | -- | 04 |
| CW403 | Design of Hydraulic Structures-II | 04 | -- | 02(Audit) | 04 |
| CW404 | Design of Structures – III | 04 | -- | 02 | 05 |
| CW405 | Elective-I | 04 | -- | 02(Audit) | 04 |
| CW406 | Project Part-A and Seminar | -- | -- | 04 | 03 |
| Sub Total | | 17 | 01 | 10 | 22 |
| SEMESTER-II | | | | | |
| CW407 | Water Resource Systems Engineering | 03 | 01 | -- | 04 |
| CW408 | Professional Practice | 04 | -- | 02(Audit) | 04 |
| CW409 | Foundation Engineering | 04 | -- | -- | 04 |
| CW410 | Open Channel Hydraulics | 04 | -- | 02(Audit) | 04 |
| CW411 | Elective – II | 04 | -- | -- | 04 |
| CW412 | Project – Part B | -- | -- | 04 | 03 |
| | Sub Total | 20 | -- | 06 | 23 |
| Grand Total | | 40 | -- | 16 | 45 |

| Course Code | Name of the Course | Course Code | Name of the Course |
|---|---|---|---|
| CW405A | Watershed Management | CW411A | Flood Control and Drought Management |
| CW405B | Ground Water Engineering | CW411B | Solid Waste Management |
| CW405C | Bridge and Tunnel Engineering | CW411C | Advanced Structural Design |
| CW405D | Hydropower Engineering | CW411D | Hydro informatics |

Note : Batch of 15 students for Practicals and 05 students for Project-A and Project-B.

The evaluation of subject matter (Theory / Practical) shall be continuous and as per academic calendar of the institute. The evaluation of term work and practical shall be continuous as per notification of academic section.

**CW406 PROJECT PART-A and SEMINAR (2 + 1 = 3) Credits (L: 0, T: 0, P: 04)**

Project Part A shall be a collective work of a group of 4 to 8 students. In this part students are expected to carry out literature survey and decide a topic for their project. They should also prepare an outline and methodology of work for the project work. There would be Viva-voce based on the project part A report submitted by the students.

The scope of Project-A shall be:

1. Finalization of the Topic and scope of the project in consultation with the Guide
2. Completion of Literature Survey
3. Data Collection
4. Design of Experimental set-up if required
5. Project feasibility and methodology

Suggested broad areas for project are as follows:

1. Irrigation scheme including storage and distribution works
2. A major lift irrigation scheme (from a river source)
3. Water supply scheme for a township
4. Sewerage and sewage disposal scheme for a township
5. Water supply and drainage scheme for a village or group of villages
6. Watershed development and management
7. Modern irrigation methods
8. Hydrological analysis and Design
9. Hydraulic structures
10. Prestressed Concrete
11. Concrete technology
12. Analysis and Design of Structures
13. Transportation
14. Project Management
15. Public Health Systems
16. Hydroinformatics

**Seminar (1 Credit)**: The seminar should be done on any topic individually by a student with focus preferably on real life problems in Civil and/or Water Management Engineering to be decided by students and the teachers concerned. Seminar work shall be in the form of report submitted by the student at the end of the semester. The candidate will make a presentation before departmental faculty and the assessment will be made by two internal examiners appointed by the DUGPC, one of them will be the supervisor.

**PROJECT – PART B: (3 Credits) (L: 0, T: 0, P: 04)**

The students are expected to undertake the main component of the project work (experimental/analytical), in continuation of the Project- Part A carried out in Semester-I, and complete the entire work to the level of satisfaction of the respective guide.
The term work for Project-B shall consist of submission of three copies of typed and bound project report, on the work carried out by the batch of students in respect of the project assigned. There would be Viva-voce based on the project part B report submitted by the students.

**Final Year B.Tech. ( Civil & Water Management Engineering)**

**Semester-I**

**CW401-IRRIGATION WATER MANAGEMENT ENGINEERING-II (L: 02, T: 0, P: 0) Credits: 02**

**Objectives:**

- To enhance the understanding of advances in irrigation water application methods
- To know hydraulic design aspects of minor irrigation schemes
- To know environmental and system engineering aspects of irrigation

**1: Pressure Irrigation Methods** (10 hrs)

Advantages and limitations of sprinkler system, Components of sprinkler system, Hydraulics of sprinkler system, Power requirement of sprinkler system, Design procedure of sprinkler system, Trouble shooting and maintenance of sprinkler system, Advantages and limitations of drip system, Components of drip system, Hydraulics of drip system, Design procedure of drip system, Trouble shooting and maintenance of drip system and Advances in micro irrigation system (Subsurface drip & Cable irrigation system).

**2: Minor irrigation** (10 hrs)

Lift irrigation (Necessity, Components, Design) ,Tube well irrigation, River irrigation (KT weirs, Bandhara),Percolation tank (Site selection, Geological aspect, Location in watershed, Design) and Water harvesting structure (Wanarai Bandhara)

**3: Environment and System management aspects of irrigation** (5 hrs)

Reuse of wastewater for irrigation (Methods, Precautions), Irrigation system (Components) and Water user's participation in irrigation system management

**Reference Books:**

1. WALMI Publication No. 15 - WALMI, Aurangabad (M.S.).
2. Irrigation Theory and Practice-A.M. Michael, Vikas Publishing House Pvt. Ltd., New Delhi.
3. Irrigation Engineering- R.K. Sharma and T.K. Sharma, S.Chand & Company Ltd., New Delhi.

**CW402- PROJECT PLANNING AND MANAGEMENT (L-03, T-01, P-00) 4 Credits**

**Objective:**

- Introduce student to Principles of project management for efficient completion of the project in optimum duration with efficient use of available resources.

**1. Introduction**: Project, Project life cycle, System approach to project management & Guidelines for project management system design. (05 hrs)

**2. Project appraisal techniques:** Appraisal criteria: (Net present value, Benefit cost ratio, Internal rate of return, Payback period), Types and measures of project risk & Capital budgeting. (07 hrs)

**3. Network techniques for project management**: Development of project network, Activity, Event, Activity and event times, Float: (Start, Finish, Total, Free and Independent), Critical path

analysis, CPM and PERT model & Precedence network, Resource allocation, crashing and leveling, Computer applications in project management. (09 hrs)

**4. Project implementation**: Forms of project organization, Matrix organization, Project planning, Project control & Pre-requisite for successful project implementation. (06 hrs)

5. **Project cost management**: Types of project cost (Direct and Indirect Cost), Cost duration curve, Basic principles for measuring project cash flows & Breakdown cost. (06 hrs)

**6**. **Project quality management:** Quality control & Quality control charts. (04 hrs)

7. **Human resources management:** Recruitment, Training, Motivation and Team work (04 hrs)

**8. Principles of engineering economics:** Time value of money, Design period, Elasticity of demand and Demand and supply curves. (02 hrs)

**TERM WORK:**

1. Project network for the given activities with tabular calculation of floats.
2. Case study of a construction project involving the list of activities and location of critical path.
3. An exercise on compression and decompression of project network.
4. An exercise on plotting the cost- duration curves and measuring project cash flows.
5. Study of project management software packages.

**TEXT BOOKS:**

1. Project Management by B.M. Naik, Vani Publishers, New Delhi.
2. Project Planning and Control with PERT and CPM by Dr. B. C. Punmia.

**REFERENCE BOOKS:**

1 CPM and PERT by Srinath.
2 Principles of Cost Management by Roy Pchery.

**CW403- DESIGN OF HYDRAULIC STRUCTURES – II (L-4, T-0, P-02 Audit) 4 Credits**

**Objectives:**

- Introduce student to canal distribution system, its various components, estimation of canal discharge and concept of failure of hydraulic structure on alluvial soil, design of various structures of canal distribution system.

1. **Components of Canal and Distribution Network:** Components up to field head, rotation period and flow period of channels, water distribution policies rotation (Shejpali, Warabandi) and on demand, Chak its definition and design, Estimating capacity of channels based on water distribution policy. (04 hrs.)
2. **Hydraulic Design of Channels:** Cross section of channels use of Manning's equation, Kennedy's silt theory, and Lacey's silt theory, causes of silting, design of non-silting, non scouring channels, silt distribution over a channel cross section, land width and beams, balancing depth concept and I.S. requirements of canals. (04 hrs)
3. **Construction of Channels and Lining:** Layout, equipment and quality control, lining of irrigation channels, its justification over existing and new canal systems, advantages of lining and types of linings. Concrete, shotcrete, bricks, stones, asphalt, soil cement lining, buried membrane lining, construction and maintenance of lining. (04 hrs)

4. **Hydraulic Jump:** Its usefulness in the design of irrigation structures, definition, types of jump, momentum formula, loss of energy, location and profile of jump on a sloping glacis, profiles before the jump and after the jump hydraulic jump as a energy dissipater. (03 hrs)
5. **Theories of Seepage:** Failures of weirs and barrages, caused of failure by piping and by uplift, Bligh's creep theory for seepage flow, safety against piping and against uplift, Khosla's theory and concept of independent variables, Khosla's simple standard profile, and various types of corrections. (04 hrs)
6. **Silt Ejectors and Silt Excluders** (03 hrs)
7. **Canal Regulatory Works:** Regulation, discharge measurements, head regulators, cross regulators, falls, escapes their types, location and design. (12 hrs)
8. **Cross Drainage Works:** Necessity different types of C.D. works i.e. aqueducts, siphons, super passage, inlets and outlets, their location, hydraulic design and maintenance. (04 hrs)
9. **Irrigation Outlets:** Classes, non-modular, semi modular and rigid module outlets, their location, design and selection of outlets.

(04 hrs)

**TERM WORK:**

Term work shall consist of following:

1 Computer Programs for Canal design, Regulators C.D. Works, Canal flow

2 Neat sketches of various C,D, Works Canal falls at least-5

**TEXT BOOKS:**

| | | |
|---|---|---|
| 1 Irrigation Engineering | by | Punmia and Pande |
| 2. Irrigation Engineering | by | Garg S.K. |

**REFERENCE BOOKS:**

1. C.B.I.P. Publication No.12 (1982)
2. Canal Automation C.B.I.P Publication No. 238, 93

**CW404- DESIGN OF STRUCTURES – III (L-04, T-0, P-02) 05 Credits**

**Objectives:**

- Introduce student to design principles of various structures such as water tanks, Flat slab and basic concept, analysis and design of prestressed concrete structure.

**PART – A: REINFORCED CEMENT CONCRETE**

**1. Working stress method**: Introduction, flexure analysis and design of various R.C.sections. (06 hrs)

**2. Water Tanks:** Circular water tanks with flexible & rigid bases resting on ground, rectangular water tanks resting on ground & underground. (10 hrs)

**3. Flat Slabs:** Design of flat slab with or without drop -direct design method. (06 hrs)

**PART – B: PRESTRESSED CONCRETE** (18 hrs)

**4. Fundamentals of pre-stressing**- classifications and types of pre-stressing.

**5. Pretension and post tensioning- losses of prestress**.

**6. Flexure analysis design of PSC sections**- cable profile-limiting zone-shear and bond-End block design.

**TERM WORK:**
Term Work shall consist of the following:
1. Design and drawing of circular water tanks.
2. Design and drawing of underground and on ground rectangular water tank
3. Design and drawing of PSC girder with end block design.
4. Computer aided design of PSC beams (min.2)

**TEXT BOOKS:**
1. RCC designs : Pillai Tata McGraw Hill Pub.
2. Prestressed Concrete by Krishna Raju
3. RCC designs by Umat & Jain

**REFERENCE BOOKS:**
1. IS 456-2000, IS 3370 (part-iv), IS 1343
2. Design of Prestressed Concrete Structure by Lin T.Y.
3. R.C.C. by Puroshottam
4. Reinforced Concrete by Umat and Jain. 5. Advanced R.C.C. by Krishna Raju

**CW405- ELECTIVE – I (L-04, T-00, P-02 Audit) 4 Credits**

**CW405-A. WATERSHED MANAGEMENT (L-04, T-00, P-02 Audit) 4 Credits**
**Objectives**

- Introduce basics of soil, soil erosion and soil erosion control structures for agricultural and nonagricultural land.
- To focus on forestry in soil conservation.
- To develop the understanding of watershed Management and water harvesting structures.

**1 Mechanics of Soil Erosion:**
Types and estimation of soil erosion, trap efficiency, factors affecting erosion. Wind erosion, Stream bank erosion, Gully erosion, Principles of gullies erosion, classification of gullies, Gully control structure, Stages of development. **(**06 hrs)
**2**.**Erosion Control Structures for Agricultural Land:** Mechanical, vegetative and tillage methods of erosion control, Erosion control structures and their design, Contour bunding, Graded bunding, Broad based terraces, Bench terracing, Grassed waterways (04 hrs)
**3. Erosion Control Structures for Non Agricultural Lands:** Contour and staggered trenching, Forestry, Agro-forestry, Gully erosion-Stages of development, Ravine reclamation, (03 hrs)
**5. Farm Ponds:** Types, selection of site, survey, design, Estimates and construction, Percolation tanks and their utilization. (03 hrs)
**6 Forestry in Soil Conservation**
Management of forests, contour trenching, Specifications of different types of trenches, Forest plantation, Ravine reclamation, Shifting cultivation. (05 hrs)
**7 Fields Structure and Practices**
To control erosion by water: contour bunding, design and construction of contour bunds evolving design criteria for contour bunds, Design of vegetated waterways. Shape and waterway location, channel grade and dimensions, Grass land management. (06 hrs)

**8 Water Harvesting**

Types of storage structures, Ponds and Reservoirs, Components, location and storage capacity, seepage discharge equation, seepage line equation, seepage line as a parabola, seepage analysis by flow nets. (05 hrs)

**9 Watershed Management**

Aims and objective, Watershed types, criteria for priority watersheds, collection of data, execution, maintenance, monitoring and evaluation, Format- introduction. Watershed development: ridge-to-valley concept, Hydrology of micro–watershed (05 hrs)

**TERM WORKS:**

Term work shall consist of assignment / exercise based on above syllabus and report on field visit.

**Reference Book:**


| | | |
|---|---|---|
| 1. Principles of agricultural Engineering (Value-II) | by | Micheal A.M. and Oza |
| 2. Land & Water Management Engineering | by | Murti V.V.N. |
| 3. Water Shed Management in India | by | Mutri J.V.S. |
| 4. Manual of soil and water conservation practice | by | Gurmel Sing |
| 5. Text book of soil conservation | by | Hudson. |


**CW405-B. GROUNDWATER ENGINEERING (L-04, T-00, P-02 Audit) 4 Credits**

**Objectives**

- To study water storage structures and geological zones of saturation.
- To develop the understanding of ground water flow, well hydraulics.
- To develop the understanding of water quality pollution and legislation.

**1.Introduction**

Groundwater extent and potential in India, Groundwater exploitation methods and investigations, hydrology, water bearing properties of rocks, site selection and spacing of wells, infiltration mechanism & curves. Water balance budget and equations (04 hrs)

**2. Water storage and rock functions**

Porosity, void ratio, water retention properties, Specific retention, Specific yield, Permeability, parameters, constant & variable head analysis and equations. (04 hrs)

**3. Geological zones of saturation**

Aeration zone, soil water belt, saturation zone. Aquifers, storage coefficient water table fluctuation springs (03hrs)

**4. Ground water flow**

Specific weight, compressibility, head distribution, Laminar and turbulent flow, Reynolds number Darcy's laws and application, three dimensional flow, flownet analysis storage equations boundary conditions, steady flow states, radial flow to wells, Dupuit's equation and application, draw down curves and cone of depression. (05 hrs)

**5. Aquifer Properties**

Aquifer tests, test measurements confined aquifers discharge analysis (Theis' and Jacob's methods), unconfined aquifers and flow properties. (05 hrs)

**6. Well Hydraulics**

Types of wells and construction, infiltration galleries, tube well design and dimensions, maintenance of wells, performance tests, specific capacity, Revitalization of wells and maintenance. (05 hrs)

7. **Ground Water Exploration and Modeling**

Geologic and hydrologic methods electrical resistivity methods, Seismic methods, Magnetic methods, Gravity methods, Radio metric methods, Tracer techniques, Physical and mathematical models, Finite element methods and application. (05 hrs)

**8. Saline Water Intrusion and Artificial Recharge**

Saline water intrusion, salinity influx in estuaries, zone of diffusion and interface parameters, saline zone identification. Prevention and control of saline water intrusion. Artificial recharge and methods, wastewater recharge, detention dams, water shed management techniques, Rain water harvesting. (05 hrs)

**9. Pumps and Allied Machinery**

Discharge rates, demands, flow charts, heads and losses, power requirements, pumps types, suitability, installation and maintenance, power calculations. Flow measurements and metering distribution networks. (04 hrs)

**10. Water Quality Pollution and Legislation**: Potable water quality parameters sources of pollution and pollutants, hard water and its effects, water salinity and water logging, water test parameters, leaching and soil reclamation, pollution control boards norms, action plans and legislation. (04 hrs)

**Term work:**

1. Exercise on ground water quality parameters, pollution sources and remedial measures.
2. Exercise on bore well drilling methods (working sketch, parts drilling stage precautions flow measurement and billing).
3. Exercise on pump capacity, selection, cost analysis, installation and maintenance.
4. Exercise on ground water pollution control norms, pollution boards and legislation
5. Exercise as a case study on water shed management scheme.
6. At least ten sketches of basic figures of the course.

**REFERENCE BOOKS:**

1. Ground Water Engineering (Assessment, development and management) by K.R. Karanth
2. Ground Water by H.M. Raghunath
3. Ground Water Hydrology by D.K. Todal
4. Ground Water and Seepage by M.E. Harr.
5. Seepage, drainage and flow nets by H.R. Cedergren
6. Engineering Fluid Mechanics by C. Jaegar.

**CW405-C. BRIDGE AND TUNNEL ENGINEERING (L-04, T-00, P-02 Audit) 4 Credits**

**Objectives:**

- To introduce student to various components of bridge and tunnel, site investigation for bridge and tunnel, different types of bridge, tunnel and IRC loading in design of bridge.

**1. Introduction:** History of bridges and development, Definitions and components of bridges, Various ways of classification of bridges, Alignment finalization and economic span. (03 hrs)

**2. Investigations:** Need for investigation, Selection of bridge site, Preliminary data to be collected at site of bridge, Determination of flood discharge and waterway calculations, Depth of foundation and clearance, Afflux, Depth of scour. (04 hrs)

**3. Loadings I.R.C.:** Recommendations for loading on road and railway bridges, Substructure, general considerations, Types, Design and construction of piers abutments and wing walls, Condition of stability. (03 hrs)

**4. Foundations:** Types of foundations, Shallow piles, Wells, Use of coffer dams and caissons, Grip length, Approaches, Influence of conditions on approaches and the selection of the type of bridge, Types of construction of approaches, Culverts slab, Box type and arched types, Causeways, and submersible bridges. (03 hrs)

**5. Super Structure:** Different types of road and railway bridges, Arched, Girder and suspension type. (02 hrs)

**6. Bridge Details:** Different type of bridge floors for road and railway bridges, Bearings for bridges. (02 hrs)

7. **Construction and Maintenance:** Methods of erecting girder, Truss and maintenance of Bridges. (03 hrs)

**TUNNELING**

**1. Introduction:** History, Necessity, Detailed classification in accordance with size shape and geological considerations, Open cut tunnel. (02 hrs)

**2. Geometric Design:** Different shapes and sizes of tunnels for various works such as railways, Highways, Water carriage, Gas lines, Gradient and curves. (04 hrs)

**3. Tunnel Surveys:** Setting out, Modern instruments, Method of transfer of alignment, Accuracy of transfer. (01 hrs)

**4. Geological Conditions for Tunnels and Problems:** Problems in tunneling, Tunneling in hard rock, Methods of attack, Equipment, Drilling, Driving, Sequence of aberration, Classification of drill holes, Explosive, Types of explosives, Perfect use of explosives, Types of fitting, Delay technique, Tunnel boring, Boring machines, Mucking and rock Bolting (04 hrs)

5. **Tunneling in Soft Strata:** Methods of driving, Different types of boring machines, Mucking and supporting structures, Methods of both ordinary and pneumatic along with procedure, Equipments and accessories, Safety (04 hrs)

**6**. **Lining:** Necessity and various types of lining, Ventilation, Drainage, Lighting their requirements and various provisions, Maintenance of the tunnels (03 hrs)

**TERM WORK:**

Term work shall consist the following:

1. Problems on geometric design of tunnel.
2. Detailed sketches of various types of bridge (05)
3. Sketch of various types of girders (05)

**TEXT BOOKS:**

1. Bridge Engineering
2. Essentials of Bridge Engineering
3. I.R. C. Code for bridge No. I&II
4. Tunnel Engineering
5. Tunnel Engineering
6. I.S. 4880, I.S. 5878 Parts I to X.

**CW405-D. HYDROPOWER ENGINEERING (L-04, T-00, P-02 Audit) 4 Credits**
**Objectives:**

- This course will review the hydropower principles, present and future applications, and various design criteria of intake, penstock, turbines, draft tube, etc.
- After the successful of completion of this course, students will able to prepare the feasibility report of proposed hydropower station.

**1.Introduction to Hydropower:** Sources of energy, status of power, hydropower in India, importance of hydropower, hydropower in multipurpose reservoir system, estimation of water power potential, load curve, load factor capacity factor utilization factor, load duration curve, firm power, secondary power, prediction of load (06 hrs)
**2.Hydroelectric Plants:** Classification of hydel plants, run-of river plants, alley dam plants, historical development of pumped storage power plants, types of pump storage plant, advantages of pumped plants, two unit and three unit arrangement relative merits, reversible pump – Turbines, problems of operations topography, reservoirs and water conveyance, power house, efficiency of pumped storage plant, Small and micro hydropower. (07 hrs)
**3.Penstocks:** Classifications of penstocks, Design criteria for penstocks, Economical diameter of penstocks, blocks, Conduit valves, Bends and manifolds, Water hammer, Resonance in penstock channel, surges, surge tanks. (07 hrs)
**4. Intakes:** Intakes, types of intakes, Losses in intakes, Air entrainment at intakes, Inlet aeration, Canals fore bay tunnels. (04 hrs)
**5.Turbines:** Main types, Arrangements, Suitability and adaptability, Layouts (05 hrs)
**6. Power Channels and Settling basins** (05 hrs)
**7.Electrical and Mechanical Equipments:** Generators, Excitation, Ventilation, Cooling and fabrication, transformers, Switchgear, Central room equipments, Mechanical equipment, ransmission of electric power. (06 hrs)
**8.Power House Planning:** Surface power stations, Power house structure, Power house dimensions, Variations in design of power house, Underground (UG) power station, History, Location, Types of UG power house, Components of UG power house, Types of layout, Limitations of UG power house (05 hrs)
**9.Tidal Power:** Basic principle, Location of tidal power plant, Difficulties in tidal power generation, Components of tidal power plants, Modes of generation, Single and double basin system, Constructional aspects, Estimate of energy and power, Economic feasibility **(**06 hrs)

**TERM WORK:**
1. Analytical solution for economical diameter of open stocks.
2. Hydraulic design of simple surge tanks.
3. Salient features of an existing H.P.P.
4. Study of Power house complex and components and arrangements.
5. Neat sketches of at least ten basic figures of the course.

**TEXT BOOKS:**
1. Water power engineering by Dandekar M.M. and Sharma K.N.
2. Water power engineering by Deshmukh

**REFERENCE BOOKS:**

1. Hydro power structures by Varhney R.S.
2. Hydro electric engineering practice by Brown J.G.
3. Hydro electric practice by Creager and Justin
4. Water power development (Vols. I, II and III) by E. Mosonyi
5. A Hand Book on hydrology by Ven Te Chow

**CW406- PROJECT PART-A AND SEMINAR (L-0, T-0, P-4) 3Credit**

**PROJECT – A**

There shall be a batch of five students for undertaking a project work in Civil and Water Management Engineering on any of the following topics

1. Irrigation scheme including storage and distribution works
2. A major lift irrigation scheme (from a river source)
3. Water supply scheme for a township
4. Sewerage and sewage disposal scheme for a township
5. Water supply and drainage scheme for a village or group of villages
6. Watershed development and management
7. Modern irrigation methods
8. Allied fields of current and future interest

The scope of Project-A shall be:

1. Finalization of the Topic and scope of the project in consultation with the Guide
2. Completion of Literature Survey
3. Data Collection
4. Design of Experimental set-up if required
5. Project feasibility and methodology

Presentation of the above work carried out by the batch of students in the first semester in respect of the project assigned.

**SEMINAR**

Each candidate shall study some special topic under the subjects of Civil and Water Management branch from current literature or study a project under the subjects of Civil and Water Management branch and its actual working and design etc. under the guidance of a faculty member. He shall prepare his report together with design, computations, sketches drawings etc. And deliver a talk on the topic before other students in the presence of faculty members

The report, written in a technical reporting manner and the presentation of the talk on the subject will be treated as term work under this head and will be assessed by the two internal examiners appointed by the Head of the department, one of whom will be his guide and the other internal teacher of the concerned subject, or expert from the field

**Semester-II**

**CW407 -WATER RESOURCE SYSTEMS ENGINEERING (L-3, T-1, P-0) 4 Credits.**

**Objectives:**

- This course introduces the concepts of systems engineering to the students and intends to prepare them for applying the knowledge which they have acquired till the final year to real life problems.
- The objectives of this course are to teach the integrated approach to real life problem solving using system concepts with an emphasis on water resources.
- The basic concepts of systems engineering and various aspects of water resources systems are covered. The systems approach to problem solving is highlighted. Various systems analysis techniques like linear and dynamic programming are introduced along with the planning, design and operational aspects of water resources systems.

1. **Nature of Water Resource Systems:** Technological, economical, social, environmental, legal, and political aspects. (02 hrs)
2. **Systems Engineering:** Need, role and scope of systems engineering, definition. Concept of system, characteristics of system, hierarchy of systems. (04 hrs)
3. **Systems approach and systems analysis:** Steps in the application of systems approach. Optimal policy analysis - introduction to optimization, overview of operations research techniques. System models and their role in systems engineering. (04 hrs)
4. **Systems Analysis Techniques:** classical optimization techniques - differential calculus methods, linear and nonlinear optimization, introduction to nonlinear programming methods – Lagrange Multiplier method, Khun Tucker conditions. (05 hrs)
5. **Linear Programming:** General form of LP problem – terminology and notation, graphical solution, Simplex method of solution, solution to problems, applicability and limitations. Introduction to sensitivity analysis. Introduction to Duality. (12 hrs)
6. **Dynamic Programming:** Concept, principle of optimality, terminology, recursive relationship, comparison with LP, simple applications to resource allocation and network problems. (08 hrs)
7. **Surface Water Quantity Management:** Objectives of water resource development and management. Objective functions and type of constraints. Description of surface water resource planning problems. Introduction to reservoir planning and management. Solution of simple resource allocation and network problems using Linear programming and Dynamic Programming. (07 hrs)
8. **Groundwater System:** System configuration, characteristics, manageable resources of ground water, aspects of conjunctive use of surface and ground water. (03 hrs)

**TERM WORK:**

1. Conceptual understanding of system concepts and role of systems engineering in water resource management – Three assignments.
2. Solution to linear programming problems – Three assignments.
3. Solution to Dynamic programming problems – Two assignments.
4. Reservoir planning problem – One assignment.

**TEXT BOOKS**

1. Water Resources Systems Engineering by Hall and Dracup ,TMH Pub.
2. Operations Research by S.S.Rao, Tata McGraw Hill Pub.

**REFERENCE BOOKS**

1. Systems Approach to Water Management by Biswas A.K., McGraw Hill Pub.
2. Operations Research An Introduction by Hamdy A. Taha, PHI Pub.
3. Introduction to Operations Research by Hiller and Lieberman, McGraw Hill Pub.

**CW408 -PROFESSIONAL PRACTICE (L-4, T-0, P-2 (Audit)) 4 Credits.**

**Objectives:**

- Objective of this is to introduce student to principles of taking out quantities, analysis of rates, procedure of contract and tender legal aspects in construction, arbitration and valuation.

**1. Introduction of IS-1200:** For Modes of Measurements. (02 hrs)
**2. Taking out quantities:** Methods of Taking Out Quantities, PWD Method, English Method, Estimates of Buildings, Slab, Pipe Culvert, Septic Tank, Walls, Roads, Railway Tracks, and Canals. Plumbing Works, RCC Slabs and Framed Structures. Abstracting. (08 hrs)
**3. Analysis of rates:** Analysis of Rates for Various Items of Construction. Introduction of District Schedule of Rates. (04 hrs)
**4. Approximate estimates:** Methods of Preparing Approximate Estimates For Building, Road, Bridges, Water Supply Schemes, Sewerage Schemes And Irrigation Schemes (04 Hrs)
**5. Specifications:** Detailed specification (Reference to be made to PWD handbook and IS. 1200) for typical Civil Engineering works. Brief specifications. Principles of writing specifications. (02 Hrs)
**6.Contracts:** Various Agencies Involved In Construction Industry. Essentials of Valid on tracts. Contract Documents. Conditions of Contract. Role of Engineer in Govt. Works in Contract. Role of Architect/ Civil Engineer in Semi Govt. and Private Organizations. Performance of Contract. Breach of Contract, Termination of Contract. **(**03 Hrs)
**7. Types of Contract:** Item Rate, Percentage Rate, Lump Sum, Cost plus Percentage. Cost Plus Fixed Fee, Target, and Piece. **(**03 Hrs)
**8. Tender:** Definition, Tender Notice, Earnest Money, Security Deposits, Preparation and Submission of Security and Acceptance of Tenders. (04 Hrs)
**9.Government Procedure for Execution of Works:** Classification of Works, Administrative Approval, Technical Sanction, Bills, Measurements Book, Muster Roll, Accounts of Works and Stores, Tools And Plants, Materials at Site Account, Daily Diary. (04 Hrs)
**10.Valuation:** Definition, Nature of Value Factors Affecting Value of Land And Buildings, Salvage Value, Book Value, Market Value, Prospective Value, Sinking Fund, Depreciation, Methods of Working out Sinking Fund Installation & Depreciation, Methods of Valuation for Buildings. (03 Hrs)
**11. Properties:** Definition, Mortgage, Amortization, Arbitration, Sale of Real and Immovable Properties, Registration Sale Dead. Formation of Co-Operative Housing Societies and Related Procedure for Execution and Construction of Apartment, Act. (03 Hrs)

**TERM WORK**

Term-work shall consist of the following.

1. Estimate of a two storied building
2. Estimate of a culvert or railway track or canal or road
3. Estimate of a simple RCC framed structure/ Industrial steel structures.
4. Analysis of rates for ten items of construction.
5. Specifications for six items of construction.
6. Valuation report for a building.

**REFERENCE BOOKS:**

1. Civil Engineering Contract and Estimates by B. S. Patil
2. Estimating and Costing in Civil Engineering by B. N. Dutta.
3. Elements of estimating and costing by S. C. Rangwala.

**CW409- FOUNDATION ENGINEERING (L-4, T-0, P-0) 4 Credits.**

**Objectives:**

- Objective of this is to introduce student to estimation of bearing capacity and settlement under footing, various types of foundation, proportioning various types of shallow foundation, estimation of pile load capacity and design of foundation on black cotton soil.

**1. Bearing Capacity:** Theories – Terzaghi, Prandl, Balla, Mayer of Ultimate, net and safe bearing capacity, field load test and their limitations, standard penetration test local and general shear failure of long, square and circular footings, factors affecting bearing capacity, methods of improving bearing capacity of foundation beds, effect of water table on shape of footing, width of footing depth of footing and bearing capacity. (10 hrs)

**2. Settlement Analysis:** Causes and control of settlement, immediate settlement, consolidation settlement, differential settlement, prediction of foundation settlement from plate load test, settlement tolerance of superstructures. (04 hrs)

**3. Footings and Rafts:** Design considerations and construction of different types of footings and farts on sand and clays proportioning of footing for equal settlement, combined footings and cantilever footings. **(**04 hrs)

**4. Pile Foundations:** Types of piles, their use and functions, timber, precast, cast–in-situ sheet piles, method of pile driving, pile driving hammers, effect of pile driving on ground, selection of type of pile, determination of strength, design of pile foundation, determination of bearing capacity from theoretical analysis, point bearing, friction negative skin friction pile capacity by static and dynamic formulae, limitations, group action, number and spacing of pile in group. **(**10 hrs)

**5. Coffer Dams:** Types of coffer dams, use and salient features of construction, single wall, double wall cellular, design of braced and cellular coffer dams, circular and of diaphragm type, pumping and sealing of bottom of coffer dam. **(**04 hrs)

**6. Well and Cassions:** Types of wells, components parts, choice of particular type, design loads, scour depth, sinking, frictional resistance for wells, tilting and method of correction of wells,

cassion – open, box drilled pneumatic safety problems, working, uses, salient construction features. (04 hrs)

7. **Foundations on Black Cotton Soils:** Characteristics of B.C. soil, foundation problems in black cotton soils, foundation design principles, foundation techniques, under reamed piles, dewatering of foundation, special features of foundation for towers and tanks. **(**04 hrs)

**TEXT BOOKS:**

| | | |
|---|---|---|
| 1. Foundation Engineering | by | Phatak D.R. |
| 2. Foundation Engineering | by | Kasamalkar D.J. |
| 3. Soil Mechanics Foundation Engineering | by | Punamia B.C. |
| 4. Soil Mechanics Foundation Engineering | by | Murthy V.N. S. |
| 5. Foundation Design and construction | by | Wayne C. Teng. |
| 6. Foundation Design | by | Wayne C. Teng. |
| 7. Soil Mechanics Foundation Engineering | by | Bharat Singh |

**CW410- OPEN CHANNEL HYDRAULICS (L-4, T-0, P-2(Audit)) 4 Credits**

**Objectives**

- The objective of this course is to provide students knowledge on the parameters governing the flow through open-channels, sediment movement in natural channels and the types of water-surface-profiles.
- Students at the end of the course should be in a position to understand the principles of open channels flows, use the available energy of flow wherever possible and at the same time they should be in a position to determine water surface profile of open channel flows.

**1. Basic Principles:** Open channel flow and its classification, energy and momentum principles, critical flow and its computations, transitions. (06 hrs)

**2.Uniform Flow:** Computation of uniform flow, design of channels for uniform flow (Non-erodible, erodible and grassed channels) concept of boundary layer, surface roughness, velocity distribution of instability of uniform flow. (08 hrs)

**3. Gradually Varied Flow:** Theory and analysis, methods of computations, flow profiles in non-prismatic channels, spatially varied flow. (08 hrs)

**4. Rapidly Varied Flow:** Flow over spillway, hydraulic jump and its use in energy Dissipation. (05 hrs)

**5. Unsteady Flow:** Equation of continuity and equation of motion, waves and their classification, celerity of wave, surges. (08 hrs)

**6. Sediment Transport:** Introduction, basic theories of sediment transportation, dunes and ripples, scour criteria (06 hrs)

**7. Open Channel and River Models:** Principles and interpretations of results (05 hrs)

**TERM WORK:**

5. Experiments on transitions
6. Computation of $\alpha$ and $\beta$ for various channel.
7. Term Work shall be consisting of at least 4 problems on each of the listed above.
8. Computation of GVF using computer programs.

**TEXT BOOKS:**

1. Open Channel Hydraulics by Ven Te Chow (McGraw Hill Pub. 1959)
2. Flow in open Channel by K. Subramanya ((McGraw Hill Pub. 1986.)
3. Open Channel Hydraulics by Strum.

**CW411- ELECTIVE – II (L-4, T-0, P-0) 4 Credits.**

**CW411-A. FLOOD CONTROL AND DROUGHT MANAGEMENT**

**Objectives:**

- Introduction of frequency analysis, hydrological time series analysis and modeling.
- Student at the end of the course understand Reservoir planning, flood control and study of drought.

**1. Introduction**

Hydrologic cycle, various hydrologic processes, network standards and design, radars, satellite data acquisition. (03 hrs)

2. **Frequency Analysis**

Definitions, assumptions and data requirement, plotting positions, commonly used distributions for frequency analysis, parameter estimation techniques, and goodness of fit test, chi square test, K-S test and D-index test, standard errors. (06 hrs)

**3. Hydrologic Time Series Analysis and Modeling**

Classification, general statistical properties of hydrologic time series components, over year trends, trends analysis, estimation of parameters, methods of separating periodic and stochastic components, steps in time series modeling, deterministic and stochastic models. (08 hrs)

**4. Reservoir Planning**

Water availability studies, storage terms (active storage, within year storage, carry over storage, conceptual storage), Reservoir capacity, Yield determination, Ripple's methods, Residual mass curve, Simulation, Methods based on range and low flow sequences, Probability matrix methods, Flow duration curve and energy computations. (08 hrs)

**5**. **Flood Control**

Flood forecasting needs and problem, methods of flood control, flood zoning, flood protection structures, levees, channel improvements and channel diversion, soil conservation, flood routing techniques, channel routing and reservoir routing, electrical analogy method, economics of flood control. (06 hrs)

**6. Urban Hydrology**

Introduction, qualitative descriptions of urban storm water runoff, determination of urban storm water runoff. (03 hrs)

7. **Drought**

History and nature of drought, impact of drought, definition and classification of drought. Drought relief measures. Drought management, long term strategy of drought mitigation, people's participation in drought management programme, evaluation of drought management programme. Watershed management, Ground water recharging methods, Ground water exploitation, Ground water management, (08 hrs)

**TERM WORK**

Term work shall consist of assignments based on above syllabus.

**TEXT/REFERENCE BOOKS**

1. Hydrology - Varshney
2. Hydrology for Engineers - Linsley, Kohlar
3. Handbook of hydrology - V.T. Chow
4. Stochastic hydrology - Dr. P. Jayarami Reddy
5. Watershed hydrology - R. Suresh
6. Engineering hydrology - K. Subramanya
7. Applied hydrology - K.N. Mutreja

## CW411-B. SOLID WASTE MANAGEMENT

**Objectives:**

- To study sources of solid wastes, composition and properties of solid waste, effects of solid waste on environment. Disposal and treatment of hazardous waste.

**1. Definition of Solid Waste**

Domestic garbage, ash, rubbish, dust, debris. Commercial: wastes form offices, shops and markets, Industrial waste, Hazardous waste, Supreme Court directives about solid waste, MSW-2000 rules.

**2. Sources of Solid Wastes**

Household wastes, waste from commercial establishments, office, vegetable markets, fish and meat markets, stables, solid waste from construction activities, industries, hospital wastes and dead animals.

**3. Quantity Composition and Properties of Solid Waste**

Per capita municipal solid waste, quantity of industrial solid waste per unit produced, composition: physical, chemical and biological constituents, sampling and characterization of solid wastes. Engineering design principles, materials balance analysis.

**4. Effects of Solid Waste on Environment**

Effects on air, soil, water (surface and ground), public health hazards.

**5. Collection, Segregation, Storage and Transportation of Solid Waste**

House to house collection centers: location, sizes, types of containers and maintenance. Transportation methods: manual, mechanical, methods with or without compaction in transportation of waste. Optimization of transportation routes. Modern techniques of analysis.

**6. Disposal of solid waste**

Various methods of disposal: dumping, land filling, composting, incineration, sea disposal. Innovative approaches: Segregation, reduction at source, recovery and recycle. Role of rag pickers. Disposal methods: sanitary land filling, composting; aerobic and anaerobic, incineration, vermi-composting.

7. **Industrial solid waste**

Wastes produced during manufacturing process, operation of pollution control facilities, minimization at source, recycling and disposal. Textile, Tanning, Paper, Food processing, Pharmaceutical, Foundry and smelting, Cement, Thermal power etc.

**8. Modern Trends**

Thermal, biological and chemical conversion technologies, energy conversion, Kyoto protocol, carbon trading.

**9. Disposal and treatment of hazardous wastes**

Types, generation minimization at source, separate collection, treatment and disposal. Rules for disposal.

**10. Legal aspects of solid waste management**, incentives to industry for waste management.

**TERM WORK:**

Each student shall prepare a report on any industrial/hazardous/municipal solid waste comprising source, characterization, transportation, recycle, treatment and disposal.

**REFERENCE BOOKS:**


1) Integrated Solid Waste Management Technologies by Theisen and Vigil, McGraw Hill International.
2) Solid Waste Management in Developing Countries by A. D. Bhide, NEERI, Nagpur publication.
3) Manual on Solid Waste Management – AIILSG, Mumbai publication,2006


**CW411-C. ADVANCED STRUCTURAL DESIGN**

**Objectives:**

- Objectives of this subject is to introduce student to design principles of various structures such as Elevated water tanks, Silos, Bunkers etc. IRC loading, analysis and design of bridge.

**1.** Analysis and design of building frames above two storeys and two bay. (10 hrs)

**2.** Design of overhead rectangular and circular service reservoirs, Design of intz water tanks, membrane analysis, analysis of staging by cantilever method (use of tables from IS3370) design of foundations. (16 hrs)

**3.** RCC bridges with IRC loading, design of slab bridges, simply supported T beam bridges, a complete design of super structure. (14 hrs)

**4.** Design of RC Bunkers and soils. (12 hrs)

**TERM WORK:**

Term work shall consist of at least two applications with programming based on the syllabus. Computer programming must have flow – chart listing of source programme and computer output.

**TEXT BOOKS:**


1.Matrix operations on computer by Bhirud L.L., Oxford IBH Pub. Co.

2.Matrix Finite Element, Computer aided structural analysis by Madhujit Mukhapadhaya, Oxford IBH Pub. Co.

3. Numerical Algorithms by Krishnamurthy E.V. and Sen S.K. Affiliated East West Press Pvt. Ltd.

4. Reinforced Concrete – Fundamental Approach by Edward G. Wavy, Prentic Hall Inc.

5. “Essentials of bridge engineering by Victor D. J.

6. IRc Codes. IS. 3370
7 RC designs by Punmia B. C.

**CW411-D. HYDRO INFORMATICS**

**Objectives:**

- To study mathematical modeling, artificial intelligence techniques, computer modeling, advanced information technology applications.

**1. Mathematical modeling:** Mathematical tools and techniques, partial differential equations, Numerical method, Advanced modeling applications to water resources and environmental engineering problems. (10 hrs)
**2. Artificial Intelligence Techniques:** Artificial neural networks, Genetic algorithm, Parallel processing, Fuzzy logic, Application in water resources and environmental engineering. (10 hrs)
**3. Computer Modeling:** Computational hydraulics, computer modeling in environmental engineering, Introduction to various computer packages for water resources and environmental engineering (10 hrs)
**4. Advanced Information technology application:** IT applications in water resources and environmental engineering, Web based modeling, Application of virtually reality, Internet based modeling, Multi media applications, WWW based hydro informatics systems. (10 hrs)
**5. Decision Support systems**: Knowledge based systems, Computer based decision support systems. (6 hrs)

**TERM WORK**
Term work shall consist of assignments based on above syllabus.

**Text Book**
Barr, A; Cohen P. R and Feigenbau, E. A, "Artificial Intelligence- The Handbook, Vol.5 Addision Wesley, 1989.
Dayoff, J.E., Neural Networks Architecture: An Introduction, Van Nostrand Reinhold, New York, 1990.
Abbot M. B. Hydroinformatics- information Technology and the Aquatic Environment, Avebury Technical, Aldershot, UK, 1991.

**CW412- PROJECT PART-B (L-0, T-0, P-4) 3Credits**
The students are expected to undertake the main component of the project work (experimental /analytical), in continuation of the Project-A carried out in Semester-I, and complete the entire work to the level of satisfaction of the respective guide.

The term work for Project-B shall consist of submission of three copies of typed and bound project report, on the work carried out by the batch of students in respect of the project assigned. There would be practical examination based on the project report submitted by the students.