## GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD
(An Autonomous Institute of Government of Maharashtra)

### Department of Civil Engineering

Teaching and Evaluation Scheme

**ME (Full-Time) in Civil- Water Resources Engineering**

### SEMESTER-I

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Code</th>
<th>Subject</th>
<th>Scheme of Teaching (Hrs/Week)</th>
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<td>Engineering Hydrology and Hydrologic Systems</td>
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### LABORATORY COURSES

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# SEMESTER-III

## THEORY COURSES

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# SEMESTER-IV

## LABORATORY COURSES

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*L-Lectures, T-Tutorials, P-Practicals, TA-Teacher Assessment, ESE-End-Semester Examination*

**Elective I:**
- CE 545: Water Supply Systems
- CE 546: Irrigation Techniques
- CE 547: GIS Applications in Water Resources Engineering

**Elective II:**
- CE 554: Water Power Engineering
- CE 555: Environmental Evaluation of Water Resource Development
- CE 556: Neuro Fuzzy Applications
CE541: Computational and Statistical Methods

**Teaching Scheme**

<table>
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<th>Lectures-</th>
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<td>End-Semester Examination</td>
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**Course Objectives:**

1. Student will get in depth information about statistical analysis, probability and soft computing skills.
2. Student will be able to execute programmes related to water resources engineering.
3. Student will be able to judge and compare the solution of a field problem.

**Unit-1**

6+2

**Unit-2**
Regression Analysis: Simple Linear Regression, Evaluation of Regression – Confidence Intervals and Tests of Hypothesis – Multiple linear Regression – Correlation and Regression Analysis, Skewness, Moments and Kurtosis

6+2

**Unit-3**
Classification and Presentation of data, Basic Concepts of Probability, Probability Axioms, Analysis and Treatment of Data, Population and Samples, Measures of Dispersions, Measures of Symmetry, Discrete and Continuous Probability Distribution Functions

6+2

**Unit-4**
Finite difference methods and its applications to water resources Engineering, Introduction to FEM and its applications to water resources Engineering

6+2

**Unit-5**
Fuzzy logic, Fuzzy Mathematical Operations, Neural Networks, Mathematical Model of Neuron, Architecture, Introduction to genetic algorithm, Operators, Applications

6+2

**References:**

CE 542: Engineering Hydrology and Hydrologic Systems

Teaching scheme: 

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Evaluation Scheme: 

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<tr>
<td>End-Semester Examination</td>
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Course Objectives: Students will be able to:

1. Carry out reservoir and channel flood routing.
2. Plan watershed management works by using GIS.
3. Analyze meteorological parameters required for water resource management.

Unit -1


Unit -2


Unit -3


Unit -4


Unit -5

Climate Change: Global Circulation Model (GCM), Regional Circulation Model (RCM), Data collection and analysis, downscaling of climate parameters, uncertainty of regional climate projections, climate change impact, adaptation strategies, Risk and Vulnerability of Agriculture, climate forecasting, Soil and Water Assessment Tool (SWAT) Hydrological Model, Socioeconomic scenarios, Policy Initiatives for Climate Change Adaptation in India.

References:

CE543: Ground Water Engineering

Teaching scheme
Lectures: 3 hours/week
Tutorials: 1 hour/week
Total Credits: 04

Evaluation Scheme
Test: 20 Marks
Teacher Assessment: 20 Marks
End-Semester Examination: 60 Marks

Course Objectives:
1. Student will know the different terminologies related with groundwater hydrology.
2. Student will be able to assess ground water potential.
3. Student will be able to know and plan ground water exploration techniques.

Unit -1
Ground Water: zone of aeration, saturation, soil water, adsorbed water, capillary water, capillary potential, storage coefficients of aquifers, porosity, specific yield, specific retention, unconfined and confined aquifer, fluctuation of water table, fluctuation of the piezometric surfaces, ground water potential in India, geophysical methods for groundwater explorations.

Unit -2
Well Hydraulics: Darcy's law, permeability and transmissivity, Theim and Dupuit's theory for unconfined and confined aquifers. Groundwater flow potential, Ground water theory for one, two and three dimensional problem, Differential equations governing groundwater flow for steady and unsteady state problems, use of finite difference method to solve simple ground water flow problem.

Unit -3
Evaluation of aquifer properties: aquifer tests control well, observation well, measurement during test, Theis method, Jacob and Chow’s method of determination of aquifer parameters, Theis’ recovery method, bounded aquifer, interference among wells, Image well theory and its application in groundwater flow.

Unit -4
Groundwater well losses, water well design and well drilling: well screen, development and completion of wells, Rotary drilling and Rotary percussion drilling, maintenance of wells. Groundwater Modeling: Groundwater flow, sand models, viscous fluid models, membrane model, thermal model, electric analog model and mathematical models.

Unit -5
Groundwater development and management: Conjunctive use, artificial recharge of groundwater- different methods, subsurface dam, waste water recharge, recharge by urban storm runoff, ground water storage changes, percolation from tanks, recharge from irrigated fields, dating of ground water, estimation of ground water discharge, ground water resource evaluation in India, groundwater quality.

References:
CE544: Advanced Fluid Mechanics

Teaching scheme
Lectures: 3 hours/week
Tutorials: 1 hour/week
Total Credits: 04

Evaluation Scheme
Test: 20 Marks
Teacher Assessment: 20 Marks
End-Semester Examination: 60 Marks

Course Objectives
Students will be able to:
1. Know concept of source and sink.
2. Design boundary layer thickness and separation.
3. Calculate drag and lift forces.
4. Carry out dimensional and model analysis.

Unit -1
Basic principles of fluid motion, role of fluid properties in fluid motion, types of fluids based on rheological diagram, equation of continuity in Cartesian and cylindrical co-ordinate system, kinematics of fluid flow, Lagrangian and Eulerian approach, path lines, streak lines, stream lines and their equations, elements of particle motion, circulation, rotational and irrotational flows, vorticity, angular deformation, stream function, potential function Laplace's equation, flownets.

Unit -2
Dynamics of fluid flow, Euler's equation of motion in Cartesian and cylindrical co-ordinate system, accelerations, force potential, energy equation, applications of energy equation Two dimensional irrotational flow, uniform flows, source, sink, vortex flows, flow around corners, combination of two or more potential flows, doublet, source in uniform flow, source, sink and uniform flow, doublet, uniform flow and vortex etc. method of images.

Unit -3
Laminar motion, transformations, Navier-Stokes equation of motion, exact and approximate solutions to Navier-Stokes equation, laminar stability, Reynold's number, analysis of laminar stability, laminar boundary layer theory, boundary layer thickness, displacement, momentum, and energy thickness, boundary layer equations, boundary layer integral momentum equation, Blassius solution.

Unit -4
Turbulent flow, mean, fluctuating and absolute velocities, Reynold's equation for turbulent flows, energy equations, eddies in fluid motion, integral equations of momentum, role of mixing length theories, Prandtl's mixing length theory, Taylor's vorticity transfer theory, Karman's similarity hypothesis, Boussinesq hypothesis, boundary layer separation, flow behind bluff bodies, wakes, concept of lift and drag forces of immersed bodies.

Unit -5
Dimensional and model analysis, homogeneity of equations, basic principles, Raleigh's and Buckingham's pi methods, model analysis, dimensionless numbers and their significance, similarities, undistorted models, tilted models, river and channel distortion, tidal rivers, estuaries.
References:

1. S. Narsimhan (1973) "Engineering Fluid Mechanics", Orient Longman
3. Hohanthy A.K. (! 994) "Fluid Mechanics, Prentice Hall of India, New Delhi
CE545: Elective -I (Water Supply Systems)

Teaching scheme: Evaluation Scheme:
Lectures 3 hours/Week Test 20 Marks
Tutorial 1 hour/Week Teacher Assessment 20 Marks
Total Credits: 04 End-Semester Examination 60 Marks

Course Objectives: Student will be able to:
1. Explain design concept of different water treatment units.
2. Identify suitable method of treatment to be used for removal of impurity.
3. Design conventional water treatment plant.
4. Analyze water distribution system.

Unit -1

Unit -2
Conventional Treatment Processes: Sedimentation, Type of Sedimentation, Zone Setting, Filtration, Gravity Granular — Media Filtration, Head Losses, Back Washing and Media Filtration, Head Losses, Back Washing and Media Fluidization — Pressure Filters — Slow Sand Filters, Coagulation and Flocculation Coagulants, Theory of coagulation and flocculation process, coagulation kinetics, coagulant Aids, Rapid Mixing Devices, Disinfection, Disinfection Methods, Fluoridation, De-fluoridation.

Unit -3

Unit -4

Unit -5
Node flow analysis, optimization techniques in pipe networks, hydraulic design of water supply systems, pumping systems, distribution Reservoirs and Service Storage.

References

CE546: Elective -I (Irrigation Techniques)

Teaching scheme:
Lectures 3 hours/Week
Tutorial 1 hour/Week

Evaluation Scheme:
Test 20 Marks
Teacher Assessment 20 Marks
End-Semester Examination 60 Marks

Course Objectives: Student will be able to:
1. Justify a process of irrigation system.
2. Design micro irrigation system.
3. Compare different irrigation system.

Unit -1
Water Conveyance System: Open channel, Lined and unlined channels, types of lining, economics of lined channels. Cross drainage works, Regulating structures, Types of CD works, Aqueduct, Super passage, siphon, culverts etc. Layout and design concepts

Unit -2
Head Regulator, Cross regulator, their layout, and hydraulic design, Conveyance through closed conduit system, elements, Controlling devices, general design concepts.

Unit -3
Lift Irrigation: General concepts, Elements of lift irrigation system, Design considerations involved in Intake well, Jack well, rising main, and distribution system, Concepts and economics.

Unit -4
Drip irrigation, General concept, Advantages, limitations, elements of drip irrigation system, design.

Unit -5
Sprinkler irrigation, General concept, advantages and limitations, Components of the system, types of sprinklers, design concept.

References
CE547: Elective — I (GIS Applications in Water Resources Engineering)

Teaching scheme:
Lectures  3 hours/Week
Tutorial    1 hour/Week
Total Credits   04

Evaluation Scheme:
Test 20 Marks
Teacher Assessment 20 Marks
End-Semester Examinations 60 Marks

Course Objectives: Students will be able to:
1. Explain various terminologies related with Geographic Information System (GIS).
2. Identify suitable image for carrying out detailed investigations by using GIS.
3. Analyze and plan cropping pattern.

Unit -1

Unit -2
Flood and Draught Studies, Flood plane zoning — inundated areas — evaluation models — Draught assessment and Monitoring. Command Area Studies — Cropping patterns, conditions of crops, irrigation systems performance — crop yield estimation

Unit -3

Unit -4
Reservoir Sedimentation, Erosion and Deposition — Catchment Area Treatment — Estimation of Sediment Load — Use of models.

Unit -5
Environmental Applications — Urban Storm water Studies — Solid waste management — wetlands, nonpoint sources pollution.

References:
CE548: Seminar-I

Teaching scheme:  Evaluation Scheme:
Lectures 0 hour/Week  Term Work 25 Marks
Tutorial 4 hours/Week  Viva-voce 25 Marks
Total Credits 02

Course Objectives: Student will be able to:
1. Carry out the literature survey on a particular topic of interest.
2. Compare different methodologies to analyze the given assignment.
3. Write a technical report of research analysis and design on any topic of interest.

Seminar shall be a term work submitted in the form of technical report of research, analysis and design on any current topic in the concerned or allied field. It is expected that the students should refer the journals, and proceedings of National and International seminar/conferences. Student should follow International practice of seminar report writing (International journals). The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and the talk thereon by internal examiner i.e. guide as appointed by the Principal of the institution. Seminar topics from text and reference books will not be accepted.
CE549: Advanced Fluid Mechanics Laboratory

Teaching scheme:
- Lectures 0 hour/Week
- Practical 4 hours/Week
Total Credits 02

Evaluation Scheme:
- Term Work 25 Marks
- Viva-voce 25 Marks

Course Objectives: Student will be able to:
- Interpret the flow around immersed lamina.
- Plot flow net.
- Analyze various discharge measuring devices.

Performance of experiments based on studies is expected by the candidates during Advanced Fluid Mechanics Laboratory. Students have to perform minimum eight of following experiments in the laboratory.
1. Flow around immersed lamina using Hele shaw model
2. Study on electric analogy apparatus (design experiment)
3. Verification of Bernoulli’s equation
4. Study of hydraulic jump
5. Calibrations of at least two hydraulic weirs (design experiment)
6. Study experiment on infiltrometer/evaporimeter
7. Calculation of flow profiles in hydraulic channel (design experiment)
8. Behavior of sediment particles in river model
9. Experiment on wind tunnel
10. Assignment on model analysis (design experiment)

Candidates are required to submit the duly completed journals before the end of semester.
CE550: Hydraulic Structures

Teaching scheme:
Lectures 3 Hrs/Week
Tutorial 1 Hrs/Week
Total Credits 04

Evaluation Scheme:
Test 20 Marks
Teacher Assessment 20 Marks
End-Semester Examinations: 60 Marks

Course Educational Objectives:
1. Student will know the different terminologies related with hydraulic structures.
2. Student will be able to design different hydraulic structures such as dams and spillways.
3. Student will be able to decide suitability of individual hydraulic structures in different situation.

UNIT-1

Earthen Dams, types of earthen dams, choice of type of dam, causes of failure of earth dams, design criteria for earth dams, selecting a suitable preliminary section for an earth dam, design of earth dams; stability analysis of slopes: shape of slip surface, and method of slices.

UNIT-2

Seepage through Dam Section and its Control: fundamentals of seepage flow, Laplacian equation and flow net. Determination of top flow line and discharge through dam, seepage force and its effects, steady seepage. Drainage of Embankment: horizontal drain, chimney drain, design of filter, use of impervious core in seepage control. Control of seepage trough foundation, cut off trench, partial cutoff and upstream impervious blanket.

UNIT-3

Gravity dams, forces acting, modes of failure, elementary and practical profile, low and high gravity dam, design of gravity dam, drainage gallery, joints in a gravity dam, foundation treatment in a gravity dam, strengthening and raising of gravity dams, deterioration and repairs of concrete dam, deformation measurement of dam body by plumb lines and off dam reference point.

UNIT-4

Arch dams: types and its suitability, equations of cylindrical shells, general concepts about trial load method and elastic shell method. Hollow gravity dam, structural features, Buttress dam, types: flat slab type, massive head type, multiple arch type and prestressing of buttress dams.

UNIT-5

Spillways - Determination of capacity, types, ogee, side channel, chute, shaft and siphon. Basic principles of hydraulic design, energy dissipation arrangements below spillway. Spillway Gates: Types such as Tainter, drum, vertical lift, automatic gates. Outlets through dams: types, hydraulics of outlet works, river intakes and trash rack.

References:
2. Sharma, H.D. "Concrete Dams" Metropolitan Printers, Delhi 110153
CE551: Water Resources Systems Planning & Management

**Teaching scheme:**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
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**Evaluation Scheme:**

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<td>End-Semester Examinations</td>
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**Course Objectives:** Students will be able to:

1. Carry out economic analysis of water resources project
2. Solve the optimization problem in water resources engineering
3. Analyze water quantity and quality management

**Unit 1:**

**Unit 2:**
Methods of Systems Analysis: Linear Programming Models, Simplex Method, Sensitivity Analysis, Dual Programming, Dynamic Programming Models,

**Unit 3:**
Non-linear Programming, Gradient Techniques, Stochastic Programming, Simulation, Multi Objective Optimization.

**Unit 4:**

**Unit 5:**

**References:**

Unit 1: Soil, Plant, Water and Atmosphere Relationship
Soil and water as vital resources for agricultural production. Water retention by soil, soil moisture characteristics, field capacity, permanent wilting point, plant available water and extractable water.
Soil irrigability classifications, factors affecting profile water storage. Determination of soil water content, computation of soil water depletion, soil water potential and its components, hydraulic head. Field water budget water gains and water losses from soil, deep percolation beyond root zone, capillary rise.

Unit 2: Hydrology and Soil and Water Conservation

Unit 3: Watershed Management

Unit 4: Irrigation Water Management
Crop water requirements. Soil water depletion, plant indices and climatic parameters. Methods of irrigation, surface methods, overhead methods, Pressurized irrigation system such as drip and sprinkler irrigation. Merits and demerits of various methods. Hydraulics of furrow, check basin and border irrigation, Hydraulics and design of pressurized irrigation systems. Irrigation efficiency and economics of different irrigation systems. Agronomic considerations in the design and operation of irrigation projects, Optimum crop plans and cropping patterns in canal command areas. Quality of irrigation water and irrigation with poor quality water. On farm water management, socio-economic aspects of on farm water management. Scope for economizing the use of water. Reuse of waste water, Treatment of wastewater, treatment of Greywater.

Unit 5: Management of Degraded, Waterlogged and Other Problematic Soils and Water
association concept and responsibilities. Environmental considerations in land and water resources management.

References:
**CE553: Channel and River Hydraulics**

**Teaching scheme:**
- Lectures: 3 Hrs/Week
- Tutorial: 1 Hrs/Week
- Total Credits: 04

**Evaluation Scheme:**
- Test: 20 Marks
- Teacher Assessment: 20 Marks
- End-Semester Examinations: 60 Marks

**Course Objectives:** Students will be able to:
1. Carry out energy depth relationship
2. Determine flow profiles in open channel
3. Analyze the hydraulic jump in rapidly varied flow

**Unit 1:**
Basic concepts of free surface flows: flow regimes, velocity and pressure distribution, kinetic energy and momentum principles, energy-depth relationships, specific energy, critical depth, computation of the critical depth, section factors, hydraulic exponents, specific force diagram, theoretical concepts of channel bed roughness, transitions in channel sections.

**Unit 2:**
Uniform flow, Chazy's equation, Manning's formula, roughness coefficients, equivalent roughness, uniform flow computations, gradually varied flow, dynamic equation, classification of flow profiles, GVF in different slopes, Computation methods and analysis: Direct integration, Breese’s method, Chow’s method, numerical methods: direct step method, standard step method

**Unit 3:**
Rapidly varied flow, momentum equation for hydraulic jump, energy loss, classification of jumps, length and location of hydraulic jump in prismatic channel, rolling and ski jumps, energy dissipation works, Flow measurements: thin plate and sharp, broad, round crested weirs, critical depth flumes, Unsteady flows, equation of continuity, equation of motion, uniformly progressive waves, positive and negative surges, flood routing

**Unit 4:**
Fluvial hydraulics: Origin, ad properties of sediments, size, shape, fall velocity and its effects, orientation, grain size distribution, incipient motion of sediment particles, competency, lift force concept, critical tractive force approach, theoretical and sub theoretical analysis of Shield, White, and Iwagaki, regimes of flow, ripple and dune regime, characteristics

**Unit 5:**
Resistance to flow in alluvial streams, basic equations, theories of bed load suspended load, design of stable channels, Lane's theory, Kennedy's theory, Lacey's theory, tractive force methods of design of stable channels, design of stable channels in cohesive soils.

**References:**
CE554: Elective - II (Neuro Fuzzy Applications)

Teaching scheme:

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<tbody>
<tr>
<td>Tutorial</td>
<td>1 Hrs/Week</td>
</tr>
<tr>
<td>Total Credits</td>
<td>04</td>
</tr>
</tbody>
</table>

Evaluation Scheme:

<table>
<thead>
<tr>
<th>Test</th>
<th>20 Marks</th>
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</thead>
<tbody>
<tr>
<td>Teacher Assessment</td>
<td>20 Marks</td>
</tr>
<tr>
<td>End-Semester Examinations:</td>
<td>60 Marks</td>
</tr>
</tbody>
</table>

Course Objectives: Students will be able to:

1. Carry out neural network model
2. Determine membership function in fuzzy logic
3. Analyze the neuro-fuzzy computing

Unit 1:
Introduction: Basic concepts of Neural Networks and Fuzzy Logic, Differences between conventional computing and Neuro-Fuzzy computing, Characteristics of Neuro-Fuzzy computing

Unit 2:
Fuzzy Set Theory: Basic definitions and terminology and membership functions œ formulation and parameters, basic operations of fuzzy sets œ complement, intersection, vision, t œ norm and conorm

Unit 3:
Fuzzy Reasoning and Fuzzy Inference: Fuzzy relations, Fuzzy rules, Fuzzy reasoning, Fuzzy Inference Systems, Fuzzy modeling, Applications of Fuzzy reasoning and modeling in Civil Engineering Problems

Unit 4:
Fundamental concepts of Artificial Neural Networks: Model of a neuron, activation functions, neural processing, Network architectures, learning methods.

Unit 5:

References:
CE555: Elective - II (Environmental Evaluation of Water Resources Development)

**Teaching scheme:**
- Lectures 3 Hrs/Week
- Tutorial 1 Hrs/Week
- Total Credits 04

**Evaluation Scheme:**
- Test 20 Marks
- Teacher Assessment 20 Marks
- End-Semester Examinations: 60 Marks

**Unit 1:**

**Unit 2:**
Principles of environmental engineering, Ecological diversity, its importance and conservation, Ecosystem evaluation, landscape-main ecological elements, Diversity, matrices, patches, corridors, Interrelations of ecological elements in a cultural landscape, Reclamation and environmental engineering, Water resources and ecology, Saving endangered species, International and regional convention on environmental protection.

**Unit 3:**
Environmental Indicators, Indicators for climate, Indicators for terrestrial subsystems, Indicators for aquatic subsystems, Selection of Indicators, Socio-economic indicators, Indicators for economy, Social indicators, Indicators for health and nutrition, Cultural indicators

**Unit 4:**
Environmental issues in water resource development, Land Use, Soil erosion and their sort and long term effects, Eco system studies, Flora, Fauna, Aquatic and terrestrial ecosystems, ecosystem balance, Disturbance and long term impacts, Changes in quantity and quality of flow, Sedimentation, Environmental impact assessment of water resources development structures, Case Studies.

**Unit 5:**

**References:**
CE556: Elective - II (Water Power Engineering)

Teaching scheme
Lectures: 3 hours/week
Tutorials: 1 hour/week
Total Credits: 04

Evaluation Scheme
Test: 20 Marks
Teacher Assessment: 20 Marks
End-Semester Examination: 60 Marks

Course Educational Objectives:
1. Student will know the different terminologies related with water power engineering.
2. Student will be able to assess hydro power potential.
3. Student will be able to know and plan different structures for hydro power generation.
4. Student will be able to decide suitability of individual power plant in different situation.

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UNIT-1
Water Power, sources of energy, status of power in world, place of hydropower in a power system, choice of type of generation. Basic water power equation, estimation of discharge and head available. Classification of hydel plants, run-of-river plant, general arrangement of run off river plant, valley dam plants, diversion canal plants, storage and pondage and illustrative examples.

UNIT-2
Nature of demand: Load curves, load factor, capacity factor, utilization factor, diversity factor, load duration curve, firm and secondary power and prediction of load. Intakes: types, elements of an intake, losses in intakes, air entrainment at intakes, inlet aeration, canal, forebay and tunnel.

UNIT-3
Conveyance System: Classification of penstock, design criteria for penstock. Economical diameter of penstock, anchor blocks, conduit valves, and types of valves, bends and manifold, water hammer, Tail Race: Functions, Surge tank: Function, location, types such as simple, restricted orifice and differential.

UNIT-4
Power station: surface power station, power house structure, power house dimensions, lighting and ventilation, variations in design of power house. Underground power station, location of underground power station, type of underground power station, Advantages and limitations of underground power house, Comparison of underground and surface power station and types of layouts.

UNIT-5
Pumped storage plants: concepts, general layout and types. Tidal power stations: concepts, general layout, classification, types. Other types of power plant: depression power plant and

References:
Brown, G. Etal — "Hydro electric engineering practice" Vol. I, II and III.
CE557: Seminar-II

Teaching scheme: Practical: 2 hours/Week
Evaluation Scheme: Term Work: 25 Marks,
Practical Exam: 25 Marks

Course Objectives: Student will be able to:
1. Carry out the literature survey on a particular topic of interest.
2. Compare different methodologies to analyze the given assignment
3. Carry out model formulation and model analysis

Topic of the seminar II shall be decided in such a way that it will enhance the knowledge of the student in a particular topic which is not covered in the syllabus. It is expected that the students should refer the journals, and proceedings of National and International seminar/conferences. Student should follow International practice of seminar report writing (International journals). The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and the talk thereon by internal examiner i.e. guide as appointed by the Principal of the institution. Seminar topics from books will not be accepted.
CE 558: WATER RESOURCES SOFTWARE LABORATORY

Teaching scheme: 
Practical: 2 hrs/week

Evaluation Scheme: 
Term Work : 25 Marks
Practical Exam: 25 Marks

Course Objectives: Student will be able to:
i) Learn different software related to water resources engineering
ii) Analyze optimization models using different softwares
iii) Solve real problems using these softwares

Learning of software and solving examples is expected by the students during software laboratory work. Minimum TWO of the following are required to perform in the software laboratory.

1. Study on Fluid Flow software
2. Study on Kanal ++ software
3. Working on GRAM++ software
4. Application of MATLAB and its toolboxes
5. Arc GIS & SWAT model for water resources
6. Working in LINGO environment for water resources application
7. Working in SPSS for water resources application
8. Study on HEC-6 model
9. Study on Aquifer Well test
10. Application of ground water vistas
11. Study on DAMBRK software
12. Study on River CAD model

Students are required to submit the duly completed journals at the end of semester.
GE 611 : Research Methodology (Institute Elective)

Teaching scheme
Lectures: 3 hours/week
Tutorials: 1 hour/week
Total Credits: 04

Evaluation Scheme
Test: 20 Marks
Teacher Assessment: 20 Marks
End-Semester Examination: 60 Marks

Unit-I

Unit-II
Data analysis, Types of data, process of data analysis: sampling, cleaning etc. Classification and Presentation of data, Basic Concepts of Probability, Probability Axioms, Analysis and Treatment of Data, smoothening of Data, Population and Samples, Measures of Central Tendency, Measures of Dispersions, Measures of Symmetry, Measures of Peakedness. Regression Analysis – Simple Linear Regression, Multiple linear Regression, Correlation.

Unit-III

Unit-IV

Unit-V

References:
CE612: Dissertation Part-I

Teaching Scheme:
Practical: 24 hours/Week

Evaluation Scheme:
Term Work: 50 Marks
Practical exam: 50 Marks

The dissertation shall consist of research work done by the candidate or a comprehensive and critical review of any recent development in the subject or a detailed report of project work consisting of experimentation /numerical work, design and or development work that the candidate has executed.

In part I of dissertation it is expected that the student should refer national and international journals, proceedings of national and international seminar/conferences. Emphasis should be given to introduction of topic, literature reviews, objectives of the study along with some preliminary work/experimentation carried out on dissertation topic.

Student should submit part I dissertation report (soft bound in three) copies covering the content discussed above and highlighting the features of work to be carried out in part II of the dissertation. Student should follow International practice of dissertation writing (International journals).

The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and talks thereon by internal examiner i.e. guide as appointed by the Principal of the institution.
The part – II of dissertation will be continuation of part-I. After completion of work satisfactorily the examinee shall submit the dissertation in soft bound two copies to the head of the department. The examinee shall present the pre-synopsis of dissertation work before two internal examiners out of which one will be the guide. The suggestions given by these two examiners should be incorporated before submitting the final four copies to the head of the institution. The term work marks should be submitted to the controller of the examinations by the internal guide, he should take into account the opinion of other two examiners who were present at the time of pre-synopsis.

Viva-voce examination shall consist of defense presented by the examinee on his/ her work in the presence of other teachers and students and two examiners appointed by the head of the institution, one of whom will be the guide and second will be external examiner.