

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - II
Subject: Computational & Soft Computing Techniques
Total Theory Period: 40
Total Marks in End Semester Exam: 100
Minimum of class test to be conducted: 02

Branch: Civil Engg.
Code: Code: 5004211(020)
Total Tutorial Period: 12

OBJECTIVES:

- To educate the students to know about computing techniques
- Develop the different numerical technique and logic like ANN, Fuzzy
- To educate the students on aspects data management
- Develop the model Applications for monitoring and management of Environment

Unit-I: Computing Principles

Introduction to Computing techniques –Algorithms and Flowcharts, Numerical methods -Solution to ordinary and partial differential equation using Finite difference and Finite element method , Numerical integration and differentiation, Design of digital models for Environmental applications.

Unit-II: Artificial Intelligence

Knowledge based Expert system concepts -Principle of Artificial Neural Network (ANN) –Neural Network Structure –Neural Network Operations –ANN Algorithm -Application of ANN Model to Environmental field –Genetic Algorithms.

Unit-III: Fuzzy Logic

Fuzzy sets, fuzzy numbers, fuzzy relations, fuzzy measures, fuzzy logic and the theory of uncertainty and information; applications of the theory to inference and control, clustering, and image processing -Network analysis models.

Unit-IV: Data Management

Data base structure -Data acquisition -Data warehouse -Data retrieval-Data format Attribute -RDBMS – Data analysis -Network data sharing -Statistical Analysis (SYSTAT) -Regression -factor analysis - Histogram-scatter diagram - Goodness of fit.

Unit-V: Environmental Modeling Using MATLAB

Introduction to MATLAB Software –Environmental modeling principles and MATLAB Applications –Pollutants transport, decay and degradation modeling using MATLAB. Case studies.

OUTCOMES:

- Ability to understand the computing techniques.
- Ability to apply the principle of soft computing for solving Environmental problems
- Ability to assess the Environmental Impacts using ANN and Fuzzy logic.
- Ability to employ modern advanced computing tools in environmental studies

REFERENCES:

1. Aliev R. A, and AlievRashad, "Soft Computing and its Applications", World Scientific Publications Co. Pte.Ltd. Singapore, 2014.
2. Chepra S. C. and Canele R. P., "Numerical Methods forEngineers", McGraw-Hill, a business unit of The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York, NY 10020. 6th Edition 2014.
3. Data-Driven Modeling: Using MATLAB in Water Resources and Environmental Engineering, Springer; 2014 edition.
4. Kotteguda, N.T., and Renzo Resso, Statistics, "Probability and Reliability for Civil and Environmental Engineers", McGraw Hill Companies Inc., New York, 2008.
5. Mathews J. H. and FinkK.D. , "Numerical methods using MATLAB", Pearson Education 2010.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - II
Subject: Environmental Impact Assessment
Total Theory Period: 40
Total Marks in End Semester Exam: 100
Minimum of class test to be conducted: 02

Branch: Civil Engg.
Code: 5004212(020)
Total Tutorial Period: 12

Prerequisite: Not Required.

Objective: To introduce applications of environmental engineering in highways projects.

Unit-I:

Introduction: What are EIA, Purpose, and Project types, Inputs and how do environmental impacts arise.

Unit-II:

EIA: Process-stages, Project cycle.

Unit-III:

Environmental impact assessment (EIA): Environmental statement and target areas fixation, Scooping, Objectives, Air pollution transport models, Noise propagation model.

Unit-IV:

Methods for carrying out EIA starting from feasibility studies, Case studies of EIA with special emphasis on development projects like highways.

Unit-V:

Preparation of environmental management plan (EMP) procedure for obtaining environmental clearance, sitting guidelines for industries, public participation in carrying out EIA and EMP.

Expected Outcome: The Student would be able to understand about EIA, Methods for carrying out EIA starting from feasibility studies and Preparation of environmental management plan.

Text Books:

1. Canter, Environmental Impact Assessment, McGraw Hill Inc.

Reference Books:

1. Kadiyali, L. R., Traffic Engineering and Transportation Planning. Khanna Publishers, New Delhi.
2. Environmental consideration in planning and design of highways in India, IRC, New Delhi.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - II
Subject: Advanced Ground Water Hydrology
Total Theory Period: 40
Total Marks in End Semester Exam: 100
Minimum of class test to be conducted: 02

Branch: Civil Engg.
Code: 5004213(020)
Total Tutorial Period: 12

Pre-requisite: Basic knowledge of hydrology, soil mechanics and fluid mechanics.

Objectives: To gain knowledge in groundwater hydrology and its analysis.

Unit-I:

Introduction - Ground water development in India, Soil moisture, Classification of subsurface water, Characteristics of fluid and the Medium, Specific yield, Porosity, Storage co-efficient, Permeability, Compressibility. Aquifers Classification of aquifers.

Unit-II:

Darcy's law, Range of validity of Darcy's law. Co-efficient of permeability. General Hydrodynamical Equations for the flow of Fluids through Porous media, The Equation of continuity, Equations of motion, Dupuit's equations for unconfined seepage flow, Plane free surface flow with horizontal impervious base without and infiltration and evaporation, Confined and semi-confined flow.

Unit-III:

Unconfined flow towards well with uniform infiltration from the ground surface, Confined radial flow towards the well, Discharge as a function of drawdown, well efficiency, Radius of influence, Lowering of ground water table, Unsteady confined flow, Well losses.

Unit-IV:

Ground Water Quality: Water sampling, potable water standards of WHO and BIS. Conjunctive Use of Surface and Ground Water, Economics of CU, Design of irrigation system & water supply based on CU.

Unit-V:

Geophysical Investigations: Surface geophysical techniques, Electrical resistivity, Seismic refraction and reflection, sub surface method, well logging. Making up and production wells, construction and maintenance of tube wells, filter materials and education wells.

Expected outcome: To develop understanding of groundwater mechanism, and apply for conjunctive use and artificial recharge.

Texts/Reference Books:

1. Ground water Hydrology, Todd D K, John Wiley
2. Ground water H M Raghunath, Wiley
3. Groundwater Science, C R Fitts, Elsevier
4. Hydraulics of groundwater, Bear J, MGH
5. Hydrogeology, Davis and Deweist, John Wiley,
6. Ground water Resources Evaluation, Walton MGH

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - II
Subject: Design of Hydraulic Structures
Total Theory Period: 40
Total Marks in End Semester Exam: 100
Minimum of class test to be conducted: 02

Branch: Civil Engg.
Code: 5004214(020)
Total Tutorial Period: 12

Prerequisite: Basic knowledge of hydrology, open channel flow, soil mechanics, and irrigation.

Objective: To impart knowledge and skills in design of Hydraulic Structures.

Unit-I:

Geology of Dam sites, reservoirs and tunnels, site investigations and interpretation, treatment of bed foundation.

Unit-II:

Gravity dam- forces acting on a dam uplift forces, earthquake effects stability requirements, design criteria and factor of safety, two dimensional analysis, distribution of shear and normal stresses, principle stresses and analysis of gravity dams.

Unit-III:

Control of cracking, transverse and longitudinal joints. Galleries in dams. Earth and Rock fill dam: Type, analysis and design.

Unit-IV:

Arch dams and Buttress Dams – Characteristics, forces and criteria for safe design, simple trial load analysis for arch dams, use of models and recent trends in design.

Unit-V:

Design of spillways and outlet works.

Expected Outcome: To design and analyse the Hydraulic Structures.

Texts/Reference Books:

1. Irrigation and Hydraulics Structure, S K Garg, Khanna Publishers.
2. Irrigation and Hydraulics Structures, B C Punmia, Laxmi Publishers.
3. Irrigation, Hydraulic Structures and Water Power Engineering – K. R. Arora, Standard Publishers and Distributors, Delhi-6.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - II
Subject: Reservoir Operations and System Analysis
in Water Resources
Total Theory Period: 40
Total Marks in End Semester Exam: 100
Minimum of class test to be conducted: 02

Branch: Civil Engg.
Code: 5004231(020)
Total Tutorial Period: 12

Pre-requisite: Basic knowledge of hydrology, fluid mechanics and numerical techniques

Objectives: To understand the operation and planning of reservoir.

Unit-I:

Purpose and types of reservoir, principle of reservoir planning, investigations required.

Unit-II:

Physical characteristics of reservoir, reservoir yield, fixations of storage capacity of reservoir, flood routing.

Unit-III:

Operation of single and multi-purpose reservoirs, life of reservoir.

Unit-IV:

Reservoir sedimentation, reservoir losses, evaporation, allocation of cost of multi-purpose reservoirs.

Unit-V:

Introduction to mathematical models for reservoir models.

Expected Outcome: To apply the knowledge in planning and operation of reservoir.

Texts/Reference Books:

1. Irrigation and Hydraulics Structure, S K Garge, Khanna Publishers.
2. Irrigation and Hydraulics Structures, B C Punamia, Laxmi Publishers.
3. Irrigation, Hydraulic Structures and Water Power Engineering – K. R. Arora, Standard Publishers and Distributors, Delhi-6.

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Semester: M.Tech - II
Subject: Flood & Drought Management
Total Theory Period: 40
Total Marks in End Semester Exam: 100
Minimum of class test to be conducted: 02

Branch: Civil Engg.
Code: 5004232(020)
Total Tutorial Period: 12

Pre-requisite: Basin knowledge of hydrology, open channel flow, and soil mechanics.

Objectives: To understand floods, drought and its management.

Unit-I:

Floods: Introduction, Rational method, Empirical formulae, Unit hydrograph method, Flood frequency studies Gumbel's method, Log Pearson type III distribution, Partial duration series, Regional flood frequency analysis, Limitations of frequency studies.

Unit-II:

Flood Routing: Introduction, Basic equations, Hydrologic storage routing, Attenuation, Hydrologic channel routing Hydraulic method of flood routing, Routing in conceptual hydrograph development.

Unit-III:

Flood Management Techniques: Introduction Flood Control and Management, Catchment Area treatment, Structural Measures Non-structural Measures.

Unit-IV:

Droughts: Climatic Regions, Arid region, Semi-arid region, humid regions. Drought, Drought and rainfall, Drought classification, Drought, rainfall and temperature. Effects of drought, Effects on ground water, Effects on water quality, Effects on socio economic status.

Unit-V:

Flood forecasting, Design flood, Design storm, Flood control in India.

Expected outcome: To apply different flood and drought management techniques in real field Conditions.

Text Books/Reference Books

1. Watershed Hydrology by R. Suresh, Standard Publishers and Distributors, Delhi.
2. Chow V T, Maidment David R. and Mays Larry W. "Applied Hydrology", McGraw Hill International editions, New Delhi, 1988.
3. Mutreja K.N. "Applied Hydrology" Tata McGraw-Hill Publishing company Ltd., New Delhi, 1990.
4. Subramanya K, Engineering Hydrology, Third Edition - Tata McGraw-Hill Publishing company Ltd., New Delhi, 2015.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - II

Subject: Wastewater Management

Total Theory Period: 40

Total Marks in End Semester Exam: 100

Minimum of class test to be conducted: 02

Branch: Civil Engg.

Code: 5004233(020)

Total Tutorial Period: 12

Unit-I: Introduction

Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater generation rates, characterization and variables – Population equivalent – Toxicity of industrial effluents and Bioassay tests.

Unit-II: Industrial Pollution Prevention

Prevention Vs Control of Industrial Pollution – Benefits and Barriers – Source reduction techniques – Waste Audit – Evaluation of pollution prevention options – Environmental statement as a tool for pollution prevention – Waste minimization Circles.

Unit-III: Industrial Wastewater Treatment

Equalisation - Neutralisation – Oil separation – Flotation – Precipitation – Heavy metal Removal – Refractory organics separation by adsorption – Aerobic and anaerobic biological treatment – Sequencing batch reactors – High Rate reactors - Chemical oxidation – Ozonation – Photo catalysis – Wet Air Oxidation – Evaporation – Ion Exchange – Membrane Technologies – Nutrient removal.

Unit-IV: Wastewater Reuse and Residual Management

Individual and common effluent treatment plants – Joint treatment of industrial wastewater – Zero effluent discharge systems – Quality requirements for wastewater reuse – Industrial reuse – Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.

Unit-V: Case Studies

Industrial manufacturing process description – Wastewater characteristics – Source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Petroleum Refining – Pharmaceuticals – Sugar and Distilleries – Food Processing – fertilizers – Thermal Power Plants and Industrial Estates.

REFERENCES:

1. Eckenfelder, W.W., “Industrial Water Pollution Control”, McGraw-Hill, 1999.
2. Arceivala, S.J., “Wastewater Treatment for Pollution Control”, Tata McGraw-Hill, 1998.
3. Frank Woodard, “Industrial Waste treatment Handbook”, Butterworth Heinemann, 2001.
4. World Bank Group , “Pollution Prevention and Abatement Handbook – Towards Cleaner Production”, World Bank and UNEP, 1998.
5. Paul L. Bishop, “Pollution Prevention: Fundamentals and Practice”, McGraw-Hill International, 2000.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - II
Subject: Computational Lab
Total Marks in End Semester Exam: 75

Branch: Civil Engg.
Code: 5004221(020)

Course Objective:

- To provide the keen knowledge to students about all computer applications using in water resources engineering
- To make the student strong enough to deal all type of water resources problems

LIST OF EXPERIMENT:

1. To study various application of GIS in water resources.
2. To identify the locations for formulating the reservoirs within watershed.
3. To determine the availability of water in watershed.
4. To determine the peak discharge and plotting of Hydrograph.
5. To analyze the flow in river system.
6. To study the various parameters of sub-surface flow.
7. To study the Ground water flow modeling.
8. To determine the maximum floodplain encroachments.
9. To design the hydraulic structure using MATLAB approach.
10. To identify the artificial ground water recharge sites for confined and unconfined aquifers.
11. To forecast the climate data through statistical approach.

Course Outcome:

- Student will be able to get full knowledge on various computer applications and their usage in water resources engineering.
- Student will be able to do research in various area of water resource engineering through soft computing techniques.

Manuals/Text Book/Reference Book:

1. "Getting Started with ArcGIS by ESRI"-Bob Booth and Andy Mitchell-2001.
2. "US Army Corps, HEC-HMS, River Analysis-Applications Guide"-version 4.1 January 2010.
3. Visual MODFLOW-Student version tutorial Guide-Online version.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - II
Subject: Environmental Engg. Lab.
Total Marks in End Semester Exam: 75

Branch: Civil Engg.
Code: 5004222(020)

OBJECTIVES:

To familiarise with the physico chemical characterisation of water and wastewater.

LIST OF EXPERIMENTS:

1. Measurement of pH, Electrical conductivity and Turbidity of water samples.
2. Determination of Chlorides in water.
3. Determination of Iron and Fluoride in water.
4. Determination of Acidity and Alkalinity of water.
5. Determination of Sulphate in water.
6. Determination of hardness of water.
7. Determination of nitrate & TKN in water (demo).
8. Determination of residual chlorine of water.
9. Determination of total dissolved solids.
10. Determination of optimum coagulant dosage.
11. Determination of Ammonia Nitrogen in wastewater.
12. Coagulation and Precipitation process for treating waste water.
13. Determination of suspended, volatile, fixed and settle able solids in wastewater.
14. B.O.D. test.
15. C.O.D. test.
16. Determination of Calcium, Potassium and Sodium.
17. Heavy metals determination -Chromium, Lead and Zinc. (Demonstration only).

OUTCOMES:

The students completing the course will have the ability to use the techniques, skills and modern instruments to determine the quality of water and wastewater.

REFERENCE:

1. Standards Methods for the Examination of Water and Wastewater, 17th Edition, WPCF, APHA and AWWA, USA, 1989.