

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Semester: M.Tech - I

Subject: Advanced Hydrology

Total Theory Period: 40

Total Marks in End Semester Exam: 100

Minimum of class test to be conducted: 02

Branch: Civil Engg.

Code: 5004111(020)

Total Tutorial Period: 12

**Pre-requisite:** Basic knowledge of hydrology, open channel flow and river engineering.

**Objectives:** To understand hydrological processes and apply knowledge for analysis.

## **Unit-I:**

The hydrologic processes: Precipitation, evaporation, ET, Infiltration, groundwater, and stream flow. Hydrologic measurements and networks.

## **Unit-II:**

Analysis of discrete and continuous hydrologic data: statistical including frequency analysis, correlation, and regression analysis and multivariate analysis, time series analysis and its applications.

## **Unit-III:**

Hydrograph analysis: Unit hydrograph, Synthetic Unit Hydrograph and IUH.

## **Unit-IV:**

Flood forecasting methods, flood protection and flood plain zoning. Real Time flood forecasting & warning system .

Atmosphere Phenomenon, WMO standard, Introduction to climate change.

## **Unit-V:**

Flood routing methods, Reservoir routing and Channel routing, Hydrologic routing and Hydraulic routing (Muskingum method).

**Expected outcome:** To apply the knowledge in the real field situations related to hydrological analysis and modelling.

## **RECOMMENDED BOOKS:**

1. Chow V T, Maidment David R. and Mays Larry W. "Applied Hydrology", McGraw Hill International editions, New Delhi, 1988.
2. Mutreja K.N. "Applied Hydrology" Tata McGraw-Hill Publishing company Ltd., New Delhi, 1990.
3. Subramanya K, Engineering Hydrology, Third Edition - Tata McGraw-Hill Publishing company Ltd., New Delhi, 2015.
4. Singh Vijay. P, Elementary Hydrology Prentice Hall, INDIA, 1992.
5. Ojha C S P, Bhunya P and Berndtsson P, "Engineering Hydrology" Oxford University Press, Canada, 2008.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: M.Tech - I

Subject: Advanced Hydraulics

Total Theory Period: 40

Total Marks in End Semester Exam: 100

Minimum of class test to be conducted: 02

Branch: Civil Engg.

Code: 5004112(020)

Total Tutorial Period: 12

**Pre-requisite:** Basic knowledge of fluid mechanics and open channel flow

**Objective:** Analysis of different types of flow in open channel and Numerical analysis of open channel.

## Unit-I:

Laminar and Turbulent boundary layers, BL on a flat plate, Karman's momentum integral equation, Karman - Pohlhausen's approximate equation, Flow under adverse pressure gradient, turbulent BL over smooth and rough surfaces, Analysis of BL control.

## Unit-II:

Turbulent Flow: Reynolds Equations, Semi empirical theories of turbulence, Mixing length, vorticity transport, Karman's similarity theory flow in diverging channels.

## Unit-III:

Gradually varied flow; Classifications and Computations of Free surface profiles, Hydraulics of Confluence of channels.

## Unit-IV:

Spatially varied flow; Supercritical flows and Oblique flows, Rapidly varied flow; Hydraulic jump;

## Unit-V:

Continuity and Dynamic equations of Unsteady flow; Wave propagation and Surge; Method of Characteristics, Finite Difference Method.

## Expected outcome:

To apply knowledge in analysis of boundary layer flow, open channel flow and unsteady flow.

## Texts/References Books:

1. Garde R. J, Turbulent flows, Wiley, 1994
2. Rouse H., Fluid Mechanics for Hydraulic Engineers , Dover Pub., New york, 1961
3. Schlichting H, Gersten K., Boundary layer theory, 8th edition, Springer Publication, 2000
4. Fox & Mc Donald, Introduction to Fluid Mechanics, , John Wiley 2013.
5. Chaudhary Hanif M., Open Channel flow, Prantice-Hall of India Pvt. Ltd. New Delhi, 1993.
6. Chow V T, Open Channel Hydraulics, McGraw-Hill Book company, International editions, New Delhi, 1973.
7. Subramanya K, Flow in open channels, Second edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2001
8. Srivastava Rajesh, Flow through open channels, Oxford University press, New Delhi, 2008.

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Semester: M.Tech - I  
Subject: Water Pollution Mitigation & Management  
Total Theory Period: 40  
Total Marks in End Semester Exam: 100  
Minimum of class test to be conducted: 02

Branch: Civil Engg.  
Code: 5004113(020)  
Total Tutorial Period: 12

## **Unit-I: Sources & Characteristics of Water Pollution**

Water pollution-Sources & types of water pollution-Physical, chemical & biological-Effect of water pollution. Drinking water quality standards waste Water treatment-Primary, secondary, tertiary-

## **Unit-II: Water Quality & Standards**

Quality of surface waters, Water quality in flowing waters, Water quality in Impounded waters, Groundwater quality, Water quality standard Microbiological quality of drinking water, and d Chemical quality of drinking water.

## **Unit-III: Industrial Activity & Mitigation Measures**

Role of water in different industries-Effluent discharge characteristics- Discharge Standards for Rivers and Streams-Role of stakeholders, Public NGOS, Government in Protection of Water bodies-Control Measures-Mitigation Measures for Industrial, Water Contamination due to industries.

## **Unit-IV: Water Pollution Regulations**

Administrative regulation under recent legislations in water pollution control. Water (Prevention & control of pollution) Act 1974 as amended by Amendment Act 1988. Water (Prevention & control of pollution) Rules 1975 Water (Prevention & control of pollution) Cess Act. 1977 as amended by Amendment Act 1991.

## **Unit-V: Role of Regulatory Boards**

Sustainable Development, Rain Water Harvesting-Methods-Water Pollution- Causes and Effects-Role of Regulatory bodies and Local bodies-CPCB-TWAD Board-CMWSSB etc-Case Studies related to Effective Water Management.

## **TEXT BOOK**

1.Fair.G.M, "Water and Waste water engineering Vol. I&II". John Wiley and sons, Newyork. 2010.

## **REFERENCES**

1. Metcalf & Eddy, "Wastewater engineering, Treatment and Reuse", Tata McGrawhill publications, 2008.
2. Eckenfelder, W.W., ""Industrial Water Pollution Control", McGraw-Hill, 2009.
3. Arceivala.S.J, "Wastewater Treatment for Pollution Control", Tata McGraw-Hill, 2008.
4. "ArunaVenkat Environmental Law and Policy", PHI learning private limited New Delhi, 2011.
5. Water Management In India, "Concept Publishing Company", New Delhi.

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Semester: M.Tech - I

Subject: Remote Sensing (RS) and GIS 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: 5004114(020)

Total Tutorial Period: 12

**Prerequisite:** Basic knowledge of hydrology, physics and mathematics.

**Objective:** To study reflectance of different natural substances and do the interpretation.

## **Unit-I:**

Principal of Remote Sensing System: Fundamental laws, atmospheric Windows. EMR, Resolutions.

## **Unit-II:**

Spectral Response of Common earth Surface Features, Platform and Sensors, Orbits, Polar Orbiting and geostationary satellites, Multispectral Imaging, Visual interpretation elements, false colour concepts.

## **Unit-III:**

Fundamentals of Digital Image processing, image rectification, restoration and registration.

## **Unit-IV:**

GIS Fundamentals, vector and raster based GIS, Spatial data sources, Geo-referencing, digitization, GPS (Global Positioning System).

## **Unit-V:**

Application: Land cover mapping, reservoir sedimentation studies, Generation of thematic maps, ground water potential zonation map.

**Expected Outcome:** To apply knowledge of remote sensing for different hydrological, disaster management and hydrological predictions.

## **Text/Reference Books:**

1. Remote sensing and GIS. B. Bhatta. Oxford Publications
2. Lillesand and Keifer, Remote Sensing and Image Interpretation, Jhonwiley and Sons.
3. Sabinne, Remote Sensing principles and Interpretations, W. H. Freeman and Company, New York.
4. Burrough and McDonnell, Principles of Geographical Information Systems, Oxford University Press Satellite remote sensing. Wiley, Prof. A. K. Keshari, IIT Delhi 2016.

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Semester: M.Tech - I

Subject: Hydro Power Engineering

Total Theory Period: 40

Total Marks in End Semester Exam: 100

Minimum of class test to be conducted: 02

Branch: Civil Engg.

Code: 5004131(020)

Total Tutorial Period: 12

**Pre-requisite:** Basic knowledge of hydrology, fluid mechanics, and open channel hydraulics.

**Objectives:** To gain the knowledge of hydropower, thermal power and to analyse its potential at different sites.

## **Unit-I:**

Planning of hydropower development, Hydropower potential. Operation of power plants for peak and base load, Characteristics of power market, Integration of various types of plants, Augmentation of power plants, Pump storage plants, Small hydro power.

## **Unit-II:**

Design of hydropower installation components – intake structures, water conductor systems, tunnels, surge-tanks, penstocks, valves and anchor-blocks hydro mechanical parts.

## **Unit-III:**

Turbines and their foundations, Turbines and their performances Introduction to structural and geotechnical aspects of powerhouse design, Types of powerhouse – Underground, Semi-Underground.

## **Unit-IV:**

Gates, stilling basins, spillways., hydropower plants efficiencies, power distribution.

## **Unit-V:**

Reservoir operation for hydropower generation in a multipurpose projects, Basin scale hydropower generation in a multipurpose projects, Basin scale hydropower development, Mathematical models for reservoir sizing and opera.

**Expected outcome:** To apply the knowledge in the area of hydropower and thermal engineering.

## **Texts/Reference Books:**

1. M.M. Dandekar and K.N. Sharma, Water Power Engg., Vikas Publishing House, New Delhi.
2. R.S. Varshney, Hydropower Structures, Nem Chand and Bros., Roorkee.
3. A.K.Keshari, Water power Engineering, new age publishers, New Delhi.

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Semester: M.Tech - I

Subject: Basics of Microbiology & Biotechnology

Total Theory Period: 40

Total Marks in End Semester Exam: 100

Minimum of class test to be conducted: 02

Branch: Civil Engg.

Code: 5004132(020)

Total Tutorial Period: 12

## **Unit-I:**

Basic concepts– Spontaneous generation, Germ theory of diseases, Cell theory. Contributions of Antonie van leuwenhoek, Joseph Lister, Robert Koch, Louis Pasteur, Edward Jenner, John Tyndall, Sergei N. Winogradsky, Selman A waksman, Alexander Flemming, Paul Erlich, Fannie Hesse, Elie Metchnikoff, Kary Mullis.

## **Unit-II:**

Sterilisation and disinfection- Definitions, Principles. Methods of sterilization- Physical methods (Heat, Filtration), Radiation and Chemical methods. Control of sterilization and Testing of sterility.

## **Unit-III:**

Microscopy – Principles, Light microscope, Phase Contrast, Dark field, Bright field, Fluorescent, Interference microscope (Stereo microscope), Confocal, Inverted microscope, and Electron microscope (TEM and SEM). Measurement of Microorganisms- Micrometry. Staining- Simple, Gram staining, Negative staining, Capsule staining, Spore staining, Flagellar staining, Nuclear staining and Acid fast staining.

## **Unit-IV:**

Microbiological media, composition and types: selective and differential media Growth curve and growth kinetics. Influence of environmental factors for microbial growth. Nutritional groups of bacteria: overview Estimation of Microbes- Direct Microscopic count, Turbidometric assay, TVC- Indirect Method- CO<sub>2</sub> liberation- Protein estimation- Development of pure culture methods. Cellultra structure: Peptidoglycan structure and synthesis. Cytoplasmic matrix and components: Inclusion bodies. Maintenance and Preservation of cultures.

## **Unit-V:**

Taxonomy– Principle and its types (Classical approach– Numerical, Chemical, Serological and Genetic). Bacterial taxonomy – Bergey's manual of Systematic Bacteriology (Eubacteria and Archaeobacterium).

## **REFERENCES:**

- Prescott, L.M J.P. Harley and C.A. Klein 1995. Microbiology 2nd edition Wm, C. Brown publishers.
- Michael J. Pelczar, Jr. E.C.S. Chan, Moel : Microbiology McGraw Hill Book R. Krieg, 1986 Company
- Stainer R.Y. Ingraham J.L. Wheolis H.H and Painter P.R. 1986 The Microbial world, 5<sup>th</sup> edition. Eagle Works Cliffs N.J. Prentica Hall.

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Semester: M.Tech - I  
Subject: Integrated Water Resources Management  
& Water Harvesting  
Total Theory Period: 40  
Total Marks in End Semester Exam: 100  
Minimum of class test to be conducted: 02

Branch: Civil Engg.  
Code: 5004133(020)  
Total Tutorial Period: 12

## **OBJECTIVES:**

Students will be introduced to the role of disciplines of ecology and socio-economic play in Management of water resources.

### **Unit-I: Context for Iwrm**

Water as a global issue: key challenges and needs –Definition of IWRM within the broader context of development –Complexity of the IWRM process –Examining the key elements of IWRM process.

### **Unit-II: Water Economics**

Economic view of water issues: economic characteristics of water good and services–Non-market monetary valuation methods –Water economic instruments, policy options for water conservation and sustainable use –Case studies. Pricing: distinction between values and charges –Private sector involvement in water resources management: PPP objectives, PPP options, PPP processes, PPP experiences through case studies –Links between PPP and IWRM.

### **Unit-III: Water Supply & Health within the Iwrm Consideration**

Links between water and human health: options to include water management interventions for health –Health protection and promotion in the context of IWRM –Health impact assessment of water resources development.

### **Unit-IV: Agriculture in the Concept of Iwrm**

Water for food production: „blue“ versus „green“ water debate –Virtual water trade for achieving global water security –Irrigation efficiencies, irrigation methods and current water pricing.

### **Unit-V: Water Legal and Regulatory Settings**

Basic notion of law and governance: principles of international and national law in the area of water management. Understanding UN law on non-navigable uses of international water courses –Development of IWRM in line with legal and regulatory framework.

## **OUTCOMES:**

The students will gain knowledge about economic aspects of water and also broad understanding of the complexities of dealing with water resources problems.

## **REFERENCES:**

1. Technical Advisory Committee, Integrated Water Resources management, Technical Advisory Committee Background Paper No: 4. Global water partnership, Stockholm, Sweden. 2002.

2. Technical Advisory Committee, Poverty Reduction and IWRM, Technical Advisory Committee Background paper no: 8. Global water partnership, Stockholm, Sweden, 2003.
3. Technical Advisory Committee, Regulation and Private Participation in Water and Sanitation section, Technical Advisory Committee Background paper No:1. Global water partnership, Stockholm, Sweden, 1998.
4. Technical Advisory Committee, Dublin principles for water as reflected in comparative assessment of institutional and legal arrangements for Integrated Water Resources Management, Technical Advisory Committee Background paper No: 3. Global water partnership, Stockholm, Sweden. 1999.



# **Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Semester: M.Tech - I

Subject: Water Resources Engg. Lab.

Total Marks in End Semester Exam: 75

Branch: Civil Engg.

Code: 5004121(020)

## **Course Objective:**

1. To compare the result of analytical models introduced in lecture to the actual behavior of real fluid flows
2. To discuss and practice standard measurement techniques of fluid mechanics and their applications
3. To work on small design projects

## **List of Experiment:**

1. To determine the hydrostatic forces on immersed body.
2. To determine the energy losses in pipes.
3. To calculate the cavitation Number.
4. To determine the coefficient of discharge of Orifice meter & Venturimeter
5. Determination of minor losses due to sudden expansion and contraction in a pipe flow
6. To determine the surface profile and total distribution of a forced & free vortex.
7. To study laminar to turbulent flow and determine lower critical Reynolds number.
8. To estimate the discharge of an ogee spillway.
9. To determine the co-efficient of discharge of a weir.
10. To study centrifugal pump in series and parallel.
11. To study velocity distribution in pipe and to compute the discharge by integrating velocity profile.
12. To find out the co-efficient of evaporation using pan-evaporimeter.
13. To determine the depth of rainfall using rain-gauge.
14. To study the characteristics of Reciprocating Pump for variable speeds.
15. Study the characteristics of Francis turbine.

## **Course Outcome:**

Students who successfully complete this course will have demonstrated, the ability to:

1. Compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
2. Produce a working model through hands-on experience in fluid mechanics design and explain its operation in terms of what was learned in the course.

## **Manuals/Text Book/Reference Book:**

1. Fluid Mechanics and Machinery Laboratory-Student reference manual (online) by P. Sundara Kumar, M.Tech (PhD)
2. Experiments in Fluid Mechanics: by Singh Sarbjit, PHI Learning Pvt.Ltd.- 2012
3. Fluid mechanics with engineering applications by E.JohnFinnemore and Joseph B.Franzini (10<sup>th</sup> Edition)
4. A textbook of fluid mechanics and Hydraulic machines by Dr.R.K. Bansal-Laxmi Publications

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai**

Semester: M.Tech - I

Subject: RS & GIS Lab.

Total Marks in End Semester Exam: 75

Branch: Civil Engg.

Code: 5004122(020)

## **OBJECTIVE:**

- The hands on experiments in the image processing, GIS platforms and GPS will make the students to appreciate their importance in hydrology and water resource.

## **LIST OF EXPERIMENTS**

1. Georeferencing of top sheet and creating vector layers (MapInfo/ArcGIS).
2. Creation of attribute tables and layout preparation (MapInfo/ArcGIS).
3. Creation of Digital Elevation Model using Vertical Mapper.
4. GPS Survey and its data transformation into GIS environment.
5. Converting \*.tab file to \*.shp & vice versa using Universal Translator.
6. Transformation of Google files to GIS environment.
7. Creation of Voronoi / Thiessen diagram for points using MapInfo/ArcGIS.
8. Use of D8 pointer algorithm for deriving flow direction, flow accumulation and watershed
9. Delineation.
10. Interpolation of point data to create Spatial Maps.
11. Overlay Analysis using ArcGIS.

## **OUTCOMES:**

- Expertise in digital image processing.
- Good exposure to the Global positioning system in real time data processing.
- Potential of Geographical Information System.
- Data integration between Satellite data, GPS and GIS in Decision Making.