

Program Outcomes (POs)

PO1: An ability to independently carry out research /investigation and development work to solve practical problems

PO2: An ability to write and present a substantial technical report/document

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: Students should be able to cope with changing technological environment to meet the challenges emanating out of Climate change and Environment

Note: Program may add up to three additional POs.

Program Educational Objectives (PEOs)

The Program Educational Objectives (PEOs) are as follows:

PEO1: To prepare the students as one of the problems solving engineers/technologists in water, land and environmental fields.

PEO2: To generate technical man power at advanced level to maintain and manage the existing infrastructure of water, land and environment of the nation.

PEO3: To impart technical training to the students that empowers them to withstand changing technological environment in order to cope with the natural climate change and environment.

PEO4: To develop the students' personality in such a manner that they become responsible citizens in the society.

Full-Time PG M.Tech.(WET) Syllabus w.e.f.2017-Batch
FIRST SEMESTER

CORE COURSE (CC) WET- 01

SURFACE WATER HYDROLOGY

COURSE OUTCOMES

The student is expected to

- CO1:** To learn about precipitation and its measurement, analysis and interpretation.
- CO2:** Know about abstractions to rainfall, infiltration, evaporation and transpiration along with their estimation and derivation of unit hydrograph from hydrograph.
- CO3:** Gain Knowledge about floods, its estimation, combat floods and flood routing.
- CO4:** Familiarize with surface water pollution, causes, effects and remedial measures.
- CO5:** Acquire knowledge about disasters and its management, conservation of water and climate change and its impact on water resources.

CORE COURSE (CC) WET 02:

GROUND WATER HYDROLOGY

COURSE OUTCOMES

The student is expected to

- CO1:** To understanding the fundamentals concepts of groundwater for its storage movement governing laws with field and laboratory estimation of hydraulic properties.
- CO2:** Derivation of flow of Water through porous media its governing equations and estimation of aquifer parameters with various types of pumping tests in tube wells and open wells.
- CO3:** Application of ground water exploration techniques by using geophysical methods such as electrical resistivity methods and seismic refraction method to explore groundwater.
- CO4:** Practicing various groundwater management techniques such as artificial recharge, conjunctive use basin management and control of sea water intrusion.
- CO5:** To understand the groundwater pollution, remediation and modeling of the aquifer with respect to flow model and transport model.

CORE COURSE (CC) WET- 03

ADVANCED FLUID MECHANICS

COURSE OUTCOMES

The student is expected

- CO1:** Inculcate knowledge on description of fluid motion, stream and velocity potential, their properties and applications.
- CO2:** Develop understanding on the dynamics of Ideal fluids, applications to one dimension problems and evaluate the problems on pipe bend, venturimeter and orifice meter.
- CO3:** Imbibe the equations of real fluids like Navier Stokes equation, Stokes flow and Hagen Poiseuille flow.
- CO4:** Acquire knowledge on boundary layer flow for various expressions and equation on laminar and turbulent boundary, Integral momentum and boundary layer separation.
- CO5:** Grasp the basic idea of turbulence in fluid flow.

FOUNDATION COURSE (FC) WET-04

FC: 1 HYDRAULIC STRUCTURES

COURSE OUTCOMES

The student is expected

- CO1:** To learn about gravity dams, its analysis and design, theoretical and practical profile of gravity dam.
- CO2:** Understand spillways, types, operation, relative merits and demerits, energy dissipation, types of stilling basins and design specifications.
- CO3:** Know about earth dams, its suitability, types, design and analysis, types of failures and remedial measures.
- CO4:** Gain knowledge about rock fill dams, types, its suitability and safety measures.
- CO5:** Be familiar with classification of arch and buttress dams, stability analysis, relative merits and demerits and design.

FOUNDATION COURSE (FC) WET-04

FC: 2 APPLIED STATISTICAL METHODS

COURSE OUTCOMES

The students should be able

- CO1:** To solve applied problems using differentiation and integration.
- CO2:** Understand, apply and examine the confidence intervals, tests of hypotheses and regression analysis.
- CO3:** Gain knowledge on finite difference approximations and to solve practical problems concerned to groundwater.
- CO4:** Develop the ability to generate the governing finite element equations for systems governed by partial differential equations.
- CO5:** Comprehend the fuzzy logic control and design the fuzzy logic using genetic algorithm

FOUNDATION COURSE (FC) WET-04

FC: 3 WATER SUPPLY AND TREATMENT TECHNOLOGIES

COURSE OUTCOMES

The student is expected

- CO1:** To learn about water transmission pipe networks, non-revenue water and wastewater treatment as a part of water conservation.
- CO2:** Understand different water treatment units and its stages and design of water treatment plant using CAD.
- CO3:** Be acquainted with advanced water treatment methods for the removal of various pollutants including metals.
- CO4:** Understand corrosion of pipes, causes, effects and control.
- CO5:** Have thorough idea about ecological sanitation and know about grey water management and recycling of nutrients.

FOUNDATION COURSE (FC) WET-04

FC: 4 ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

COURSE OUTCOMES

The student is expected to

- CO1:** Develop an understanding of structure and formation of an ecosystem.
- CO2:** Gain knowledge on energy flow and to understand biogeochemical cycles and their significance in the sustainability ecosystems.
- CO3:** Gain competency and understanding of the significance of chemical and biological reactions in environmental problems.
- CO4:** Identify domestic waste, household, community waste disposals and also to familiarize with chemistry of pesticides, insecticides, herbicides, detergents, and rodent control chemicals.
- CO5:** Acquire knowledge on soil, air, aquatic, domestic water and sewage, foods, milk and industrial microbiology.

OPEN ELECTIVES (OE) WET-05

OE: 1 GEO- PHYSICAL EXPLORATION AND WATER SHED MANAGEMENT

COURSE OUTCOMES

The student is expected to

- CO1:** Understanding the hydro geological concepts and occurrence of groundwater in various rock formations application of hydrological methods to groundwater exploration.
- CO2:** Application of various geophysical methods for groundwater exploration.
- CO3:** Learning the drilling methods and construction of water wells in various rock formations.
- CO4:** Learning the design development of water well using well logging and well hydraulic methods.
- CO5:** Understanding the planning, surveying and development of watershed management programmes.

OPEN ELECTIVES (OE) WET-05

OE: 2 RIVER BASIN MANAGEMENT

COURSE OUTCOMES

The student is expected to

- CO1:** To learn know about forecast of river flows, routing the flow and river confluences.
- CO2:** To understand river confluences and its balance, reservoir routing and aggregation of water users.
- CO3:** Be familiar with management of different irrigation structures, water conservation and concerned technological innovations.
- CO4:** Have thorough understanding of judicious water allocation for various purposes and reservoir operation.
- CO5:** Gain knowledge about soil erosion and sedimentation, control measures and catchment treatment.

OPEN ELECTIVES (OE) WET-05

OE: 3 AIR POLLUTION AND CONTROL TECHNOLOGIES

COURSE OUTCOMES

The student is expected to

- CO1:** The student is expected to understand the effects of air pollutants, the metrological aspects, plume behavior and atmospheric dispersion equation.
- CO2:** Acquire knowledge on sampling techniques and analyze air quality.
- CO3:** Understand and analyze the basic mechanisms involved, working principle and design aspects of various air pollution controlling equipments.
- CO4:** Identify the methods to control sulphurdioxide and nitrogen oxide emissions.
- CO5:** Gain knowledge on vehicular emissions and auto mobiles pollution control at sources along with legal measures.

WET-06 ENVIRONMENTAL LABORATORY

COURSE OUTCOMES

Students will be able to

- CO1:** Perform common environmental experiments relating to water, wastewater and solid waste quality, and know which tests are appropriate for given environmental problems.
- CO2:** Statistically analyze and interpret laboratorial results.
- CO3:** Understand and use the water, wastewater and solid waste sampling procedures and sample preservations.
- CO4:** Demonstrate the ability to write clear technical laboratorial reports.
- CO5:** Understand the impact of water, wastewater and solid waste treatment on people and the environment.

WET-07 GROUNDWATER LABORATORY

COURSE OUTCOMES

Students will be able to

- CO1:** Explore the ground water using electrical resistivity methods.
- CO2:** Explore the ground water using seismic methods.
- CO3:** Identify civil utility using Ground Penetrating Radar.
- CO4:** Determine of aquifer characters using pumping tests.
- CO5:** Identify various layers of the subsurface using well lagging techniques.

SECOND SEMESTER CORE COURSE (CC) WET- 09

GEOSPATIAL APPLICATIONS TO WATER RESOURCES

COURSE OUTCOMES

The Student is expected to

- CO1:** Develop the knowledge on basic concepts of remote sensing, elements involved in remote sensing, its energy sources and interaction with earth's surface features and foundations of remote sensing.
- CO2:** Comprehend the concepts of Geographical Information System (GIS), components of GIS, types and data structures.
- CO3:** Understand how the data sets are acquired and developed, and can carry out the preprocessing of data inputs.
- CO4:** Improve the learning on global positioning system (GPS), factors influencing GPS, GPS signal characteristics, mathematical model and GPS applications.
- CO5:** Identify the importance of Remote sensing and GIS in various applications like water resources, drought assessment, flood plain zoning etc.,

CORE COURSE (CC) WET- 10

IRRIGATION MANAGEMENT

COURSE OUTCOMES

The Student is expected to

- CO1:** Understanding irrigation development in India and soil water plant relationships.
- CO2:** Estimation of crop water requirements.
- CO3:** Application of various irrigation methods and their design.
- CO4:** Determining of land leveling for irrigation and design of surface and subsurface field water conveyance.
- CO5:** Understanding salt problems in irrigated lands and designing suitable drainage methods.

CORE COURSE (CC) WET- 11

ADVANCED WASTE WATER TREATMENT TECHNOLOGIES

COURSE OUTCOMES

The student is expected to

- CO1:** To know about sewerage systems, design and appurtenances.
- CO2:** Learn primary treatment of both domestic and industrial waste water along with design of waste water treatment using CAD.
- CO3:** Gain knowledge about secondary or biological treatment of waste water sludge treatment and disposal, low cost waste treatment systems like oxidation pond and oxidation ditch.
- CO4:** Understand various tertiary treatment systems, desalination and reverse osmosis and be familiar with different case studies on treatment of pharmaceutical and chemical industrial effluents.
- CO5:** Know about wetlands and its role in the treatment of wastewater, constructed wetlands, recycle and reuse of treated wastewater.

FOUNDATION COURSE (FC) WET- 12

FC: 01 FLUVIAL HYDRAULICS

COURSE OUTCOMES

The student is expected to

- CO1:** To learn about types of flows and flow profiles, varied flow analysis and computation.
- CO2:** Understand dam break analysis, formation of jump on sloping channels, surges and its types.
- CO3:** Know about different methods of dimensional analysis and its applications.
- CO4:** Gain knowledge about different dimensionless members and their model laws and flow fields in which they are applicable, kinds of similarity and types of models and scale effect.
- CO5:** Be thorough with design of alluvial channels, different theories and their relative merits and demerits.

FOUNDATION COURSE (FC) WET- 12

FC: 02 SOLID AND HAZARDOUS WASTE MANAGEMENT

COURSE OUTCOMES

The student is expected to

- CO1:** To know about solid and hazardous waste transportation, environmental laws and analysis of hazardous waste.
- CO2:** Learn waste recovery processes, cradle to grave concept of handling hazardous waste.
- CO3:** Understand disposal of hazardous waste both on surface and underground and waste minimization and hazardous waste remediation technologies.
- CO4:** Be familiar with collection transportation treatment and safe disposal of both biological and electronic waste and be conversant with reuse and recycling of wastes, recovery of by products and energy audit.
- CO5:** Gain knowledge about waste land characteristics and its remediation, different kinds of pollution of soils, remediation methods.

FOUNDATION COURSE (FC) WET- 12

FC: 03 URBAN HYDROLOGY

COURSE OUTCOMES

The student is expected to

- CO1:** To know about impact of urbanization on urban runoff urban water sub systems, urban hydrologic cycle.
- CO2:** Learn modeling of storm water, probabilistic and statistical approaches of analysis of storm water data.
- CO3:** Understand urban drainage systems, sewers, components, design considerations, infiltration and exfiltration in sewers, field investigations and control measures.
- CO4:** Be well acquainted with storm water management, monitoring run off, quantity and quality, measures to mitigate damaging effects of urban storm runoff.
- CO5:** Be familiar with maintenance of urban drainage systems, pump stations, illicit connections, limitations and regulations.

FOUNDATION COURSE (FC) WET- 12

FC: 04 WATER RESOURCES SYSTEM ANALYSIS

COURSE OUTCOMES

The student is expected to

- CO1:** To develop objective function and constraints for various water resources optimization problems.
- CO2:** To develop linear programming models for water resources problems by using graphical and simplex and revised simplex techniques, to carry out sensitivity analysis and post optimality analysis.
- CO3:** To develop and solve forward and backward recursive dynamic programming models.
- CO4:** To understand optimization and simulation concepts and modeling and also apply simulation techniques in water resources problems.
- CO5:** To understand the fundamentals of economic theory as applied to water resources.

OPEN ELECTIVES (OE) WET-13

FC: 01 SUSTAINABLE WATER RESOURCES DEVELOPMENT

COURSE OUTCOMES

The student is expected to

- CO1:** To know about frame work for sustainable development of water Resources keeping global water crises in view.
- CO2:** To learn virtual water, national water policy, national water mission along with the challenges in the development of sustainable development of water resources.
- CO3:** To be thorough sustainable water resources management in local, regional and global perspective including the challenges to achieve sustainable water use and management.
- CO4:** To gain knowledge regarding water economics, options for water conservation and private sector involvement in water resources management.
- CO5:** To be well versed with water act, government policies on water conservation and the measures for sustainable water resources.

OPEN ELECTIVES (OE) WET-13

FC: 02 ENVIRONMENTAL IMPACT ASSESSMENT

COURSE OUTCOMES

The Student is expected to

- CO1:** Understand the basic concept of EIA, important steps in EIA and systematic approach for using EIA as a planning Tool for Major project activities.
- CO2:** Identify the EIA methodologies and criteria for selection of EIA methodology.
- CO3:** Recognize the impact of development activities and landuse on soil and groundwater resources and assess the impact significance on landfills and human habitation.
- CO4:** Identify and interpret the projects which create impacts on surface water environment, surface water quality, Impact significance on water resources project.
- CO5:** Understand the concept of environment audit, its objective, different types of audit and experience on site activities and gain technical knowledge during the field visit to industries.

OPEN ELECTIVES (OE) WET-13

FC: 03 HYDROPOWER DEVELOPMENT

COURSE OUTCOMES

The student is expected to

CO1: To know about hydropower systems, types, different load studies, pondage and storage.

CO2: Understand different intake structures, layout of a hydropower plant, penstock, design and anchorages.

CO3: Learn about water hammer, analysis, solution of linearized equations.

CO4: Be familiar with surge tanks, types, working, computations and stability analysis.

CO5: Be well acquainted with power houses, arrangement, selection of type, criteria for fixing dimensions, layout of underground power houses, stability and merits.

TEXT BOOKS:

1. Hydropower structure by varshney
2. Water Power Engineering by Dandekar and Sharma.
3. Fluid Transients by V.L.Streeter.

WET-14 WATER RESOURCES SIMULATION AND MODELING LABORATORY

COURSE OUTCOMES

The Student is expected to

- CO1:** Identify and Generate different types of maps using remote sensing and GIS software.
- CO2:** Prepare the maps for the delineated catchment area using GIS and Integrate the GIS and remote sensing maps.
- CO3:** Apply the concept of geomatics for watershed analysis and rainfall-runoff modelling using SWAT.
- CO4:** Execute evapotranspiration modeling using CROPWAT.
- CO5:** Identify harvesting structures in given area.

WET-15 IMAGE PROCESSING LABORATORY

COURSE OUTCOMES

The students will have hands - on experience in

- CO1:** Importing digital satellite data into image analysis system and extraction of the area of interest (AOI).
- CO2:** Carrying out geometric correction of satellite data using ground control points (GCPs), and preparing mosaics of satellite images.
- CO3:** Generating Digital Elevation Models (DEM) and NDVI from satellite image of AOI.
- CO4:** Preparation of Land use/land cover maps using unsupervised and supervised classification algorithms.
- CO5:** Priority watershed maps, flood maps including inundated areas, Surface water body maps, drought maps and their analysis.