

**DEPARTMENT OF ENVIRONMENT AND WATER MANAGEMENT**  
**A.N. COLLEGE, PATNA-13**  
**SYLLABUS**

The syllabus has been assigned as per the guidelines of the UGC and approved by Magadh University. The format of syllabus for the man honours course in Environment and Water Management will be as follows.

**ENVIRONMENT & WATER MANAGEMENT**

**B. Sc Part-I**

**PAPER-1 (A) FUNDAMENTALS OF ENVIRONMENTAL SCIENCES-I**

**Introduction of Ecology:-**

Concept of Ecosystem, Structure of ecosystem, development and evaluation of ecosystem components of ecosystem, Processes within the ecosystem, standing state of biotic components. Ecosystem functions, energy exchange between plant communities and their environment, trophic levels and energy flow.

Foreset ecosystem, grass Land ecosystem, fresh water ecosystem, agro ecosystem, vegetation mapping. Population, Demographic Structure. Impact of population growth on environment

**Environmental Chemistry:-**

Acid-base Equalibria

Fundamentals, buffering in water systems, the carbonates and other systems of importance in water, Chemistry, Degradation and Degradative pathways inorganic and organic compounds-carbonates, sulphates, nitrates, nitrites, phosphates, salt carbohydrates, fats, proteins, hydrocarbons

Xenobiotic compounds-detergents, pesticides, plastic, etc.

**Environmental Microbiology:-**

Characteristics of growth and death of microbes in natural environment. Significance of bacteria, fungi, algae, protozoa and other animals in environmental management

Role of microbes in Water degradation

**PAPER-1 (B) FUNDAMENTALS OF ENVIRONMENTAL SCIENCES-II**

**Introduction of Fluid Mechanics:-**

Properties of fluid, velocity, acceleration, streamlines, One dimensional flow of fluids.

Conservation of mass and momentum-energy equation

Laminar and turbulent flow

Resistance to flow in one dimensional systems, Darcy-Weisbach Manning and Hazen-William equations

**Flow of water in open channels and pipes:-**

Open Channel flow systems.

Definitions, uniform flow in open channels, gradually varied and rapidly varied flow, velocity distribution, open channel sections Flow in pipes.

Calculations of flow velocity and head losses flow in partially full pipes, flow distribution in pipe systems, pumping equipment for water.

Measurement of flow in pipes and open channels,

Characteristics of common pump, maintenance of common pumps

## **PAPER-2 (A) ENVIRONMENT AND ITS POLLUTIONS-I**

### **Environment:-**

Definition:-

Components-Atmosphere, hydrosphere, lithosphere, their compositions and interactions.

### **Environmental pollutions :-**

Definition:-

Causes of environmental pollution, population, resource consumption, deforestation, industrialization, agriculture, urbanization and transport.

### **Type of Pollution :-**

Industrial growth and policy, Major Industries affecting the quality of Env. New strategy in agriculture with reference to the chemical use in farming, forest policy and resource use.

### **Water pollution:-**

Source of pollution of surface and ground water

Types of pollutants-organic including biocides, surfactants, detergents, and volatile compounds, inorganic pollutants including nutrients, salts and heavy metals; biological pollution; thermal pollution. Effects of pollution on water quality and aquatic life in surface water bodies, oxygen economy, eutrophication. In lakes and reservoirs.

### **Solid Waste:-**

Municipal solid wastes, industrial solid waste (non-hazardous), major waste producing industries.

### **Hazardous wastes and their major sources:-**

### **Off shore Oil Pollution :-**

Fundamental classes in Math, Physics & Chemistry each in the 1st year.

## **PAPER-2 (B) ENVIRONMENT AND ITS POLLUTIONS-II**

### **Air Pollution:-**

Definition:-

Air Quality standards, emission standard, sources and classification of air pollutants.

Criteria Pollutants:

Carbon monoxide, Oxides of nitrogen and sulphur, particulate matter, hydrocarbons, photochemical smog and ozone.

Effects of air pollution on human health, plants, materials, visibility and Climatic changes including global warming, green house effect

### **Noise Pollution:-**

Sources, Standards, Measurement and control.

### **Soil Erosion and Land Degradation :-**

### **Radio-active pollution-Ionic and Non-ionic radiations**

**B. Sc Part-II**

**PAPER-3 (A) WATER RESOURCE MANAGEMENT-I**

**Water as a resource material:-**

Drinking Water, water used as raw material, cooling water, irrigation water, fishing water, industrial water, recreation water, cultural water

**Introduction of Hydrology:-**

Precipitation, evaporation and transpiration, run of and hydrological cycle, Hydrological budget, water balance-global and regional surface water hydrology surface Water Hydrology. Run off process, estimation of run off and hydrograph, Ground Water Hydrology

Aquifers, ground water hydraulics, safe yield, ground water collection system. Collection of hydrological data collection.

**Water Requirement for various Uses :-**

Irrigation Water

Consumptive use of water for crops, determination of irrigation requirements, comparative performance of irrigation methods. Domestic and industrial Water needs of major industries. Water requirement for non-consumptive use such as power generation and in land navigation.

**PAPER-3 (A) WATER RESOURCE MANAGEMENT-II**

**Management of Water Availability:-**

Surface water development, ground water development, weather modification and water conservation; inter basin transfer of water, wastewater reuse, desalination and other approaches

Management of extremes such as flood-structural and non-structural approach, droughts

**Collection conveyance and Distribution Systems, Water losses:-**

Location and boring of tube wells, maintenance of tube wells and related machinery.

**Micro Watershed Management:-**

Coastal Water Management

**PAPER-4 (a) WATER QUALITY MANAGEMENT-I**

**Water Quality Requirement and Standard for various Uses:-**

**Quality of Water in Different Sources:-**

**Water Quality Monitoring:-**

Sampling methods for waste water, stream and lake water and Sediment; sampling equipment.

**Water Treatment Process:-**

Conventional Water Treatments Process, Coagulation and flocculation. Sedimentation filtration, disinfection, water softening, Specific Water Treatment process, removal of iron and manganese, defluoridation, desalination.

**PAPER-4 (b) WATER QUALITY MANAGEMENT-I**

**Wastewater Treatment Process:-**

Quality and Characteristics of domestic waste water

Primary treatment, Secondary treatment (conventional and low cost), advanced waste water treatment including nitrogen and phosphorus removal. Treatment and disposal of sludge.

**Characteristics and treatment of a few Typical Industrial wastewater:-**

Maintenance of effluent treatment plants, Performance studies of a few typical treatment plants.

**Wastewater Disposal and Reuse:-****Water Quality Protection for open wells and Ponds:-****B. Sc Part-III****PAPER-5 ENVIRONMENTAL MANAGEMENT-I****Air Pollution Abatement:-**

Air Pollution and Meteorology

Meteorological parameters, vertical motion of air and atmospheric stability, wind rose diagram and wind direction frequency, lapses, temperature inversions, maximum mixing depth, Atmospheric Dispersion, Plumes and plume rise, dispersion of pollutants.

Ambient air quality monitoring

Stack gas emission and their measurement, ambient air and stack gass quality standards, threshold limit values.

Air pollution Control, of stationary source emissions-particulate emissions control and gaseous emissions control. Control of mobile source emissions.

Role of plants and trees in air pollution abatement

Disposal of hazardous waste

**Management of Land Surface:-**

Soil conservation practices for restoration of eroded soils, recovery of chemically degraded land biological reclamation techniques.

**PAPER-6 ENVIRONMENTAL MANAGEMENT****Global Atmospheric change:-****Introduction**

Global temperatures, simple global temperature models, the green house effect and its enhancement Carbondioxide, chlorofluorocarbons and other green house gases. Their sources and effects Regional effects of temperature change, Ozone layer and destruction of stratospheric ozone.

Alternative models for global atmospheric change

**Sustainable Development:-**

Concept of Environmental friendly products and technologies, non-polluting energy sources.

**Environmental Impact Assessment for creation of a Physical Facility:-**

Objective of an EIA study, Components of EIA study. Need for the proposed facility, the site and surroundings, the facility, environmental effects of construction of vacility, environmental effects of operation of the facility, environmental monitoring programmes, and remedial measures for negative impact

**Assessment methodologies:-**

Industrial plant location and city planning. Case studies, Coal fired power, water resource development project

**Economics and Benefits of Pollution Control:-****Concept of Environment Audit:-****Environmental Acts and Legislation:-**

Problems in implementation, role of public participation

**Economics and Benefits of Pollution Control:-**

Economics Environment, Principle of natural resource management, quality management, social cost-benefit, fiscal devices for pollution control, cost & price analysis, demand analysis in the contexts of environment services, Institutions and

Govt. intervention in env. quality management, People's participation and role of government.

## **ENVIRONMENT AND WATER MANAGEMENT Laboratory / Project / Field work**

### **B. Sc Part-I**

#### **PRACTICALS BASED ON PAPER-I AND II**

##### **Hydraulics Laboratory:-**

Flow visualization, Measurement of discharge in and open laboratory channel by area-velocity method using a pilot tube. Measurement of discharge in an open laboratory channel by area-velocity method using a current meter.

Measurement of discharge in an open laboratory channel using flumes (Venturi/Parshal) and notches. Measurement of discharge in a pipe using orifice meter, venture meters, water meter

Determination of resistance coefficient in a uniform channel flow and in a pipe flow.

##### **Environmental Chemistry Laboratory:-**

Estimation of water quality parameters such as turbidity, colour, solids, alkalinity, acidity, pH, hardness, sulphates, chlorides, fluorides, iron and manganese.

Colorimetric measurement of some heavy metals in effluents (e. g. Cr., Pb)

Estimation of wastewater characteristics of some typical wastewater as per Pollution Control Board requirements including DO, BOD COD, Total Kjeldahi Nitrogen phosphates, Measurement of total dust and dust fall rate.

### **B. Sc Part-II**

#### **PRACTICALS BASED ON PAPER-III AND IV**

##### **Water Management:-**

Measurement of discharge and calculation of seepage loss in a canal reach Lysimeter experiment of the same site. Measurement of pan evaporation and its comparison with penman equation

Determination of infiltration rate from a controlled plot experiment.

##### **Environment Management:-**

Field ecology-Terrestrial and Aquatic flora and Fauna, Experiments related to water quality management, ambient air sampling and determination of criteria pollutants, Monitoring of stack emission and automobile exhausts.

Visits to water and wastewater treatment plants and industries employing air pollution control equipment.

### **B. Sc Part-III**

#### **Paper-VII Project work / Job training**

#### **Paper-VIII (Practical)**

#### **PRACTICE ORIENTED COURSE/PROJECTS/SEMINAR/PRACTICAL/TRAINING**

##### **Environmental Management:-**

Determination of Bacteriological pollution in water (total and fecal coliform count)

Visits to/training in a municipal waste disposal system/national laboratories dealing in pollution control.

Study of water/wastewater/industrial effluent treatment plant and air pollution control plant (15 days in each plant)

##### **Water Management:-**

Visit to/training in a water resources development centre

##### **Practice (for Honours Students Only):-**

An EIA study of a Industrial/Water Resource Development Project

Training in water management and land management institutes of state of Centre.  
Training in a mining area reclamation project.