

SYLLABUS FOR CHOICE BASED CREDIT SYSTEM

Hons. In Environment and Water Management

(Six Semester Course)

SEMESTER- I

COURSE	CODE OF PAPERS	NAME OF PAPERS	CREDIT	TOTAL CREDIT
(A) CORE COURSE	C-1	Fundamental Of Env. Sc.-I	04	12
	C-2	Environment and its pollution -I	04	
	P-1	Practical based on C1 & C2	02+02=04	
(B) Ability Enhancement Compulsory Course	AECC	MIL (Language)	02	02
(C) General Elective	Ge-1	Physics/Chemistry/Botany/Zoology/Math	04	06
		Practical -GE	02	
			Total Credits	20

SEMESTER- III

COURSE	CODE OF PAPER S	NAME OF PAPERS	CREDI T	TOTA L CREDI T
(A) CORE COURSE	C-5	Water resources and management	04	18
	C-6	Water treatment and Management	04	
	C-7	Atmosphere and global climate change	04	
	P-3	Practical based on C5, C6 & C7	06	
(B) Skill Enhancemen t Course	SEC-I	Remote sensing, geographic information system and modelling	02	02
(C) General Elective	Ge-1	Physics/Chemistry/Botany/Zoology/Math	04	06
		Practical -GE	02	
			Total credits	26

SEMESTER- V

COURSE	CODE OF PAPER S	NAME OF PAPERS	CREDI T	TOTA L CREDI T
(A) CORE COURSE	C-11	Biodiversity & conservation	04	12
	C-12	Physics and chemistry of environment	04	
	P-5	Practical based on C11 & C12	04	
(B) Discipline Specific Elective	DSE-I	Natural resource and management and sustainability	04	04
(C) Discipline Specific Elective	DSE-II	Tools and technique	04	04
		Practical based on DSE-I & DSE-II	04	04
			Total credits	24

FIRST SEMESTER

CORE COURSE 01

C-01- Fundamentals of environment science

(lec 30)

Introduction to ecology:

Ecosystem Concept, System approach in ecological modeling and its application (Primary Productivity & Secondary Productivity). Energy flow, Different types of Ecosystem, concept of Remote Sensing in data collection and Vegetation mapping. Ecological adaptation in aquatic & desert conditions (with some plants and animal association).

Environmental Chemistry

Acid –Base Equilibrium, Preparation of chemical solutions (N & M) required for environmental studies. Buffer in water system, Knowledge of Basic standards of pollution as per BIS, CPCB. Xenobiotic compounds—Degradation and degradative pathways.

Environmental Microbiology

Study of different microbes in their natural environment. Role of microbes in relation to environmental management.

PRACTICALS:-

Basic knowledge and field visit regarding local Flora & Fauna (Quadrant studies).
Size, no., frequency, density, abundance, terrestrial fauna of college campus,
Study of aquatic Flora and fauna from any lake.

FIRST SEMESTER

CORE COURSE 02

C-02- Environment and its pollution -1

(lec 30)

Environment

Definition, Components (atmosphere, hydrosphere, lithosphere , their composition & interaction).

Environmental pollution—

Definition, cause and impact on different system of environment (Resource consumption, deforestation, industrialization, agriculture, urbanization and transport).Population ecology.

Types of pollution

Water pollution--(Sources, impact & control management)

Surface water and Ground water

Organic pollutants-- Biopesticides , Surfactants , Detergents and Volatile compounds.

Inorganic pollutants (including nutrients , salts and heavy metals) Biological pollution, Thermal pollution.

Offshore and Inshore oil pollution.

Effect of pollution on water quality & aquatic life in surface water bodies, Oxygen economy, Eutrophication in lakes & reservoirs.

Noise pollution---(Sources, impact & control management)

Level of noise pollution as determined by WHO, BIS, CPCB.

Soil pollution--(Sources, impact & control management)

Soil erosion & land degradation (conservation practices)

Radio active pollution--(Sources, impact & control management)

Ionic and nonionic radiations.

PRACTICALS:-

Qualitative study of Phytoplankton, Quantitative study of Phytoplankton by lucky's drop method.

Sedgewick plankton counting method.

THIRD SEMESTER

CORE COURSE 05

C-05 WATER RESOURCES AND MANAGEMENT

Introduction to hydrology

Precipitation, infiltration, evaporation, transpiration, run off, hydrological cycle.

Hydrological budget, water balance – global & regional surface water hydrology.

Surface water hydrology:

Runoff process, estimation of runoff & hydrograph

Ground water hydrology:

Aquifers, ground water hydraulics, safe yield, ground water collection system

Various uses of water

Agricultural , domestic , industrial power, generation, and inland navigation.

Management of water under extreme conditions; flood, salinity, draught etc.

Concept of distribution system and water losses during use,

Water quality protection for open wells and ponds.

Micro water shed management,

coastal water management,

rain water harvesting.

Practicals:-

Measurement of Pan evaporation and its comparison with penman equation,

Lysimeter experiment on the same site collection of hydrological data, rainfall, evaporation measurement, stream gauging, use of remote sensing in data collection.

THIRD SEMESTER

CORE COURSE 06

C-06 Water Treatment And Management

(lec 30)

Quality of water in different sources, Water quality monitoring

Water treatment process

Conventional water treatment process; Coagulation & flocculation, sedimentation, filtration, disinfection, water softening. Specific water treatment processes; Removal of iron & magnesium, desalination.

Quality and characteristics of domestic waste water.

Waste water treatment processes; primary treatment, secondary treatment, tertiary (advanced) treatment.

Waste water treatment including nitrogen and phosphorus removal.

Treatment and disposal of sludge.

Characteristics and treatment of a few typical industrial waste water.

Maintenance of effluent treatment plants.

Performance studies of a few typical treatment plants.

Waste water disposal and reuse.

Practicals:-

Estimation of water quality parameters such as turbidity, color, solids, alkalinity, acidity, PH, hardness, sulphate, chloride, fluoride, iron and manganese.

Colorimetric measurement of some heavy metals in effluent estimation of waste water characteristics of some typical waste water as per pollution control board requirement including DO, BOD, COD, Total kjheldahi, nitrogen and phosphates.

THIRD SEMESTER

CORE COURSE 07

C-07 Atmosphere & Global Climate Change

(lec 30)

Evolution and development of Earth's atmosphere; atmospheric structure and composition; Earth's energy balance; energy transfers in atmosphere; Earth's radiation budget; green house gases(GHGs); greenhouse effect; Movement of air masses; atmosphere and climate; *El Nino* and *La Nina*; tropical cyclone; Indian monsoon and its development, Meteorological parameters (temperature, relative humidity, wind speed and direction, precipitation);atmospheric stability and mixing heights; temperature inversion; Wind rose diagram and wind direction frequency, Lapse rate, plume behavior; Gaussian plume model. Plume and plume rise, Dispersion of pollutants.

Stack gas emission and their measurement, Threshold limiting values.

Air pollution control—particulate emission control, Control of mobile source's emissions.

Role of microbes and higher plants in air pollution abatement.

Disposal of hazardous water.

Chemistry of atmospheric particles and gases; smog – types and processes; photochemical processes;

ions and radicals in atmosphere; acid-base reactions in atmosphere; trends of global warming and climate change;

PRACTICALS:-

Determination of Bacteriological assessment of sample water (MPN,E.Coli).

Study of Industrial Effluent treatment plant and a pollution control plant(15 days in each plants).

Visit to Industries employing Air Pollution Control Equipment.

Preparation of flow chart for environmental monitoring/ stack emission.

Third semester

SKILL ENHANCEMENT COURSE (I)

REMOTE SENSING, GEOGRAPHIC INFORMATION SYSTEM & MODELLING

Theory (Lectures: 30)

Unit 1: Remote Sensing: definitions and principles; electromagnetic (EME) spectrum; interaction of EMR with Earth's surface; spectral signature; satellites and sensors; aerial photography and image interpretation.

Unit 2: Geographical Information Systems: definitions and components; spatial and non-spatial data; raster and vector data; database generation; database management system; land use/ land cover mapping; overview of GIS software packages; GPS survey, data import, processing, and mapping.

Unit 3: Applications and case studies of remote sensing and GIS in geosciences, water resource management, land use planning, forest resources, agriculture, marine and atmospheric studies.

Unit 4: Basic elements of statistical analyses: sampling; types of distribution – normal, binomial, poisson; measurements of central tendency and dispersion; skewness; kurtosis; hypothesis testing; parametric and non-parametric tests; correlation and regression; curve fitting; analysis of variance; ordination.

FIFTH SEMESTER

CORE COURSE 11: BIODIVERSITY AND CONSERVATION

UNIT I:-BIODIVERSITY

Concept of biodiversity, biogeographical classification of India, biodiversity at global, national & local level, values of biodiversity, mega biodiversity zones, India as a mega biodiversity nation, National biodiversity Action plan.

UNIT 2:- CONSERVATION OF BIODIVERSITY

In situ conservation (biosphere reserves, National parks, wildlife sanctuaries)

Ex situ conservation (botanical gardens, zoological gardens, gene banks)

Role of local communities and traditional knowledge in conservation, biodiversity hotspot, Red data book(IUCN), afforestation, social forestry: agroforestry, joint forestry management.

Unit 3: Threats to biodiversity (10 lectures)

Natural and anthropogenic disturbances; habitat loss, habitat degradation, and habitat fragmentation;

climate change; pollution; hunting; over-exploitation; deforestation; overgrazing; man wildlife conflicts; consequences of biodiversity loss.

Unit 4: Biodiversity estimation (10 lectures)

Sampling strategies and surveys: floristic, faunal, and aquatic; qualitative and quantitative methods:

scoring, habitat assessment, richness, density, frequency, abundance, evenness, diversity, biomass

estimation; community diversity estimation: alpha, beta and gamma diversity; molecular techniques:

Practicals:-

Survey report on local areas diversity.

Survey report on zoological gardens or botanical gardens.

FIFTH SEMESTER

CORE COURSE 12 Physics and Chemistry of Environment

Total

Lectures -45

A) **Gravimetry** – Precipitation, co-precipitation, washing & ignition of precipitation, organic precipitants, Applications.

B) **Titrmetry** – Acid, Base, Redox and Complexometric titration – principal & application

C) **Spectrophotometry** – Lambert – Beer's Law, Instrumentation & Application

D) **Atomic Absorption Spectrophotometry & Flame Photometry** – Principal, Instrumentation & Application.

E) **Turbidimetry & Nephelometry** - Principal, Instrumentation technique & Application.

F) **Separation Techniques** – Chromatography, Solvent extraction, Principal of adsorption Chromatography – Mechanism, Principal, technique & Application.

PRACTICALS:-

Study of gravimetry meter, nepheloturbidity meter, titration method.

Fifth semester

DISCIPLINE SPECIFIC ELECTIVE I

Natural resource management and sustainability

Unit 1: Introduction

Resource and reserves; classification of natural resources; renewable and non-renewable resources; resource degradation; resource conservation; resource availability and factors influencing its availability; land resources; water resources; fisheries and other marine resources; energy resources; mineral resources; human impact on natural resources; ecological, social and economic dimension of resource management.

Unit 2: Natural resources and conservation

Forest resources: economic and ecological importance of forests, forest management strategies, sustainable forestry; water resources: supply, renewal, and use of water resources, freshwater shortages, strategies of water conservation; soil resources: importance of soil, soil conservation strategies; food resources: world food problem, techniques to increase world food production, green revolution.

Unit 3: Mineral resources

renewable and non-renewable resources: distribution and availability nature, scope and analysis of local and global impacts of energy use on the environment; fossil fuel burning and related issues of air pollution, greenhouse effect, global warming; nuclear energy and related issues such as radioactive waste, Current and future energy use patterns in the world and in India; evolution of energy use over time; alternative sources as green energy (biofuels, wind energy, solar energy, geothermal energy; ocean energy; nuclear energy); need for energy efficiency; energy conservation and sustainability;

PRACTICALS:-

Determination of infiltration rate from a controlled plot experiment.

Measurement of discharge and calculation of seepage loss in a canal reach soil moisture,

Fifth semester
DISCIPLINE SPECIFIC ELECTIVE II

DSE-II TOOLS AND TECHNIQUE

(LEC 35)

- a) BOD Incubator:- Applications, principal & technique.
- b) hot air oven:- Applications, principal & technique.
- c) Bacterial Incubator:- Applications, principal & technique.
- d) Centrifuge:- Applications, principal & technique.
- e) PH meter:- Applications, principal & technique.
- f) Conductivity meter:- Applications, principal & technique.
- g) Autoclave:- Applications, principal & technique.
- h) Venturimeter, Orifice meter, Pitot tube:- Applications, principal & technique.
- i) microscope:- Applications, principal & technique.

Practicals:-

Study of all equipment present in the laboratory.