

Course Descriptions 4th SEMESTER

CORE COURSES

ENS401CR: Environmental Engineering

(04 credits)

AJ

Credit I: Fundamentals of environmental engineering

- 1.1. Environmental engineering: Introduction and scope
- 1.2. Sewage and storm water drainage
- 1.3. Planning of housing drainage
- 1.4. Environmental sanitation
- 1.5. Ventilation and air conditioning

SUB

Credit II: Drinking water treatment

- 1.1. Methods of water purification: flocculation, sedimentation, sedimentation with coagulation
- 1.2. Filtration: sand filters, pressure filters, horizontal filters
- 1.3. Disinfection and desalination of water
- 1.4. Chemical treatment: adsorption, gas stripping, ion exchange
- 1.5. Reverse osmosis and distillation

SUB

Credit III: Sewage treatment

- 1.1. Wastewater treatment plants: Concept, methods and design
 - a. Primary
 - b. Secondary
 - c. Tertiary
- 1.2. Sludge and its disposal techniques
- 1.3. Natural methods of sewage disposal
- 1.4. Biology of sewage treatment
- 1.5. Reclamation and reuse of industrial and domestic wastewater

MM

Credit IV: Solid and hazardous waste management

- 1.1. Solid wastes: sources, generation and their characteristics
- 1.1. Hazardous waste: sources and generation and their characteristics
- 1.2. Disposal and management of solid, industrial and hazardous wastes,
- 1.3. Hospital waste management
- 1.4. Site remediation

ENS402CR: Biodiversity and Resource Management

(04 credits)

AT

Credit I: Biogeography

- 1.1. Geographical classification and zones
- 1.2. Major biomes of the world: Distribution and characteristic features
- 1.3. Zoogeographic realms of the world: Palaeartic, nearctic, neotropical, oriental, Australian and African
- 1.4. Dispersal: Means, modes and barriers, island life
- 1.5. Migrations

Credit II: Biodiversity

MM

- 1.1. Biodiversity: Status and importance, India as a mega-diversity nation
- 1.2. Endemism: Factors controlling distribution of flora and fauna
- 1.3. Hot Spots and cold spots, concept of native and exotic species
- 1.4. Biodiversity decline: Drivers of change and pressures
- 1.5. Threatened species categories of IUCN; concept of extinction threshold and extinction debt

Credit III: Biodiversity Management

RN

- 1.1. Forest conservation: social forestry and joint forest management
- 1.2. Management of rangelands
- 1.3. Fishery resource management
- 1.4. Monitoring and management of bio-diversity
- 1.5. Biodiversity Conservation
 - a. In-situ conservation: National parks, sanctuaries, biosphere reserves, ramsar Sites
 - b. Ex-situ conservation: botanical gardens, zoological parks, zoos, seed banks, in-vitro conservation

Credit IV: Management of natural resources

SUB

- 1.1. Concept and strategies of sustainable development
- 1.2. Management of mineral resources
- 1.3. Management of fresh water resources
- 1.4. Energy crisis and conservation of energy resources
- 1.5. Concept of ecological footprint and carbon sequestration

ENS403CR: Project Work

(04 credits)

The project work shall be of practical nature and the candidate has to carry out the project work related to environment under the supervision of concerned teacher.

The distribution should be as follows:

- **Part I:** Identification of problem area and general description
- **Part II:** Study of specific literature in detail pertaining to the statement of the problem
- **Part III:** Developing a solution, methodology or proposing a hypothesis to solve the problem
- **Part IV:** Experimental analysis, results, discussion, conclusion and recommendations

Each student has to submit the dissertation of the project work for evaluation. The student has to give seminar (internal) and vivo voce (external) of the project work.

DISCIPLINE CENTRIC ELECTIVE

ENS404DCE: Aquatic Ecology

(04 credits)

SUB

Credit I: Freshwater ecology

- 1.1. Aquatic ecosystem services
- 1.2. Aesthetic values of lakes and rivers
- 1.3. Paleolimnology
- 1.4. Trophic dynamics in aquatic ecosystems
- 1.5. Role of phytoplankton and zooplankton

SUB

Credit II: Stream and river ecology

- 1.1. Concepts in stream ecology and stream classification
- 1.2. Streams and rivers as ecosystems
- 1.3. Chemical fluxes and dynamics in river and stream ecosystems
- 1.4. Aquatic insects ecology and feeding in streams and rivers
- 1.5. Concept and importance of riparian zones

CL3

Credit III: Lakes and wetland ecology

- 1.1. Ecology of lakes and wetlands: Global distribution and classification systems
- 1.2. Macrophytes: classification and zonation
- 1.3. Mixing dynamics in lakes across climatic zones
- 1.4. Effect of climate change on lakes and wetlands
- 1.5. Important lakes and wetlands of J&K

AT

Credit IV: Groundwater ecology

- 1.1. Groundwater ecology and hydrology
- 1.2. Vertical distribution of groundwater, Darcy's law and its validity
- 1.3. Types of aquifers and their classification
- 1.4. Subterranean ecosystems and biodiversity
- 1.5. Groundwater quality and management

ENS405DCE: Terrestrial Ecology

(04 credits)

AJ

Credit I: Terrestrial ecosystems

- 1.1. Ecosystem structure and processes
- 1.2. Terrestrial water and energy balance
- 1.3. Terrestrial production
- 1.4. Terrestrial decomposition
- 1.5. Carbon sequestration potential of terrestrial ecosystems

CL2

Credit II: Soil and landscape ecology

- 1.1. Soil process and ecosystem functioning
- 1.2. Soil biology
- 1.3. Concept of landscape ecology
- 1.4. Tools and approaches in landscape ecology
- 1.5. Application of landscape ecology

GAB

Credit III: Forest and agro-ecology

- 1.1. Forest community structure and function

GAB

- 1.2. Theory and practice of managing the establishment, composition, and development of the forest
- 1.3. Urban forest ecology
- 1.4. Agro-ecosystems: Concept, structural and functional components
- 1.5. Role of biodiversity in agro-ecosystems, Food security and agriculture

CL2

- Credit IV: Desert and grassland ecology**
- 1.1. Ecological complexity of the desert communities
 - 1.2. fauna and flora of the deserts
 - 1.3. Ladakh cold desert
 - 1.4. Grasslands ecology: evolution and types
 - 1.5. Biodiversity and conservation in grasslands

ENS406DCE: Environmental Planning and Auditing

(02 credits)

MM

Credit I

- 1.1. Environmental planning – importance and objectives
- 1.2. Land use planning
- 1.3. Urban development and environmental planning
- 1.4. Rural development and environmental planning
- 1.5. Role of ethics, aesthetics and science in environmental planning

Credit II

- 1.1. Principles and guidelines of environmental auditing
- 1.2. Preparation of environmental audit report
- 1.3. Waste audit procedures – sources, types and management of wastes
- 1.4. ISO 9001 and 9002
- 1.5. ISO 14000

AJ

ENS407DCE: Restoration Ecology

(02 credits)

CL2

Credit I: Concepts in restoration ecology

- 1.1. The basic principles and concepts of restoration ecology
- 1.2. Characteristics of degraded and restored ecosystems
- 1.3. Ecological indicators in restoration
- 1.4. Theory and practice of restoring animal and plant diversity
- 1.5. Ecological principles of the restoration of native ecosystems

CL2

Credit II: Restoration planning

- 1.1. Goals and objectives
- 1.2. Adaptive management and monitoring
- 1.3. Ethics of restoration
- 1.4. Role of public-private partnership in restoration
- 1.5. Measuring progress and success of restoration programs

GENERIC ELECTIVE

ENS408GE: Industrial Ecology (02 credits)

Credit I

- MM {
- 1.1. Basic principles of green chemistry
 - 1.2. Application and need of green chemistry
 - 1.3. Concept of green economy, green growth and low carbon development
 - 1.4. Introduction to industrial ecology and its relation to the concept of sustainability
 - 1.5. Principles and objectives of industrial ecology

Credit II

- MM {
- 1.6. Industrial symbiosis, industrial ecosystems and eco industrial parks
 - 1.7. Ecology and biomimicry
 - 1.8. Future and challenges of industrial ecology
 - 1.9. Concept of green technology
 - 1.10. Ecomark scheme and eco-friendly products

ENS409GE: Herbal Medicine (02 credits)

Credit I

- BAJ {
- 1.1. History of herbal medicines
 - 1.2. Introduction to medicinally important plant parts
 - 1.3. Classification of medicinal plants
 - 1.4. Ecological status of medicinal plants with special reference to Jammu & Kashmir
 - 1.5. Applications of herbal medicines

Credit II

- BAJ {
- 1.1. Pharmacodynamics and pharmacokinetics of herbal medicines
 - 1.2. Cultivation and post harvest technology of medicinal plants
 - 1.3. General methods, types and principles of extraction
 - 1.4. Purification of extracts using chromatographic methods including HPLC and GC
 - 1.5. General methods for determining the structure of herbal compounds

OPEN ELECTIVE

ENS410OE: Sustainable Development (2 credits)

Credit I

- CL3 {
- 1.1. Concept and strategies of sustainable development
 - 1.2. Principles of ecological economics – scope and usefulness
 - 1.3. Prey-predator and supply-demand cycles
 - 1.4. Environment and trade
 - 1.5. Sustainability of society, resources and framework

Credit II

- CL3 {
- 1.1. Valuation of ecosystem services
 - 1.2. Natural resources accounting
 - 1.3. Landmark events in sustainability (Agenda 21)
 - 1.4. Changes in institutional and environmental governance framework
 - 1.5. Moving towards sustainability: An Indian perspective