**DEPARTMENT OF ENVIRONMENTAL SCIENCE**

**UNIVERSITY OF KASHMIR**

**SRINAGAR-190006**



**M.Sc. in Environmental Science**

**CHOICE BASED CREDIT BASED COURSE STRUCTURE TO BE IMPLEMENTED FROM ACADEMIC SESSION JULY 2017**

**General Course Outline**

**1ST SEMESTER**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course** | **Course Code** | **Course Name** | **Paper category** | **Hours/Week** | | | **Credits** |
| **L** | **T** | **P** |
| **Core** | **ENS101CR** | **Fundamentals of Environmental Science** | **Core** | **4** |  |  | **4** |
| **ENS102CR** | **Environmental Chemistry** | **Core** | **4** |  |  | **4** |
| **ENS103CR** | **Laboratory Course** | **Core** |  |  | **8** | **4** |
| **Discipline Centric Elective** | **ENS104DCE** | **Environmental Geosciences** | **DCE** | **3** | **1** |  | **4** |
| **ENS105DCE** | **Environmental Toxicology** | **DCE** | **3** | **1** |  | **4** |
| **ENS106DCE** | **Mountain Ecology** | **DCE** | **1** | **1** |  | **2** |
| **ENS107DCE** | **Human and Environment** | **DCE** | **1** | **1** |  | **2** |
| **Generic Elective** | **ENS108GE** | **Basics of Ecology and Environment** | **GE** | **1** | **1** |  | **2** |
| **ENS109GE** | **Biogeography** | **GE** | **1** | **1** |  | **2** |
| **Open Elective** | **ENS110OE** | **Environmental Ethics and Sociology** | **OE** | **1** | **1** |  | **2** |

**Course Descriptions 1st Semester**

**CORE COURSES**

**ENS101CR: Fundamentals of Environmental Science (04 credits)**

**Unit I: Components of environment**

1. Definition, principle and scope of environmental science
2. Atmosphere: Structure and composition

SUB

1. Hydrosphere and cryosphere: Hydrological cycle
2. Lithosphere: Structure and composition
3. Biosphere: Components

**Unit II: Ecosystem dynamics**

1. Structure and function of ecosystems
2. Ecosystem resilience

ANK

1. Primary productivity
2. Secondary productivity
3. Energy flow, energy models and energy relations in ecosystems

**Unit III: Population and community ecology**

1. Characteristics of population
2. Population growth and population interactions

GAB

1. Population regulation: Density dependent and density independent
2. Concept and characteristics of communities
3. Ecological succession, primary and secondary processes in successions, climax community and types of climax

**Unit IV: Meteorology**

1. Meteorological parameters: Atmospheric pressure, temperature, precipitation, humidity and wind

AJ

1. Radiation and heat budget
2. Atmospheric stability
3. Temperature inversions

1.5. Wind roses

**ENS102CR: Environmental Chemistry (04 credits)**

**Unit I: Analytical chemistry**

1. Stoichiometry
2. Titrimetry and gravimetry

BAG

1. Potentiometry (pH and conductivity)
2. UV-visible and flame photometry
3. Atomic absorption spectrophotometry

**Unit II: Atmosphere chemistry**

AJ

1. Formation and evolution of earth’s atmosphere
2. Ions, radicals and particulates in the atmosphere
3. Formation of inorganic and organic particulate matter
4. Thermo-chemical and photochemical reactions in the atmosphere

AJ

1. Chemistry of green house gasses

**Unit III: Water chemistry**

1. Physico-chemical characteristics of water
2. Solubility of gases in water; dissolved gases in water - CO2, O2, H2S, CH4 and NH3

SUB

1. Biochemical oxygen demand and chemical oxygen demand
2. Carbonate-bicarbonate system
3. Redox potential

**Unit IV: Soil chemistry**

1. Soil profile and pedogenesis
2. Inorganic and organic components of soil

MAJ

1. Physico- chemical properties of soils
2. Biochemical properties of soil
3. Soil classification and types

**ENS103CR: Laboratory Course (04 credits)**

**Course Contents**

AT

1. Estimation of volume of a water body: Pond, pool, lake
2. Determination of the soil texture in different terrestrial habitats

AJ

1. Estimation of meteorological parameters (temperature, precipitation, humidity, wind)
2. Determination of latitude, longitude and altitude of a place
3. Demonstration of major rock types

MAJ

1. Determination of light intensity in different habitats

MM

1. Standardization of reagents – titrants (acids, bases)
2. Determination of pH, conductivity, alkalinity and acidity of water samples

SUB

1. Estimation of pH, conductivity and alkalinity of soil samples

SUB

MAJ

1. Estimation of free carbon dioxide content in water samples

AT

1. Estimation of chloride content in different water and soil samples
2. Estimation of cations (calcium, magnesium, sodium, potassium) in water samples

KM

1. Estimation of cations (calcium, magnesium, sodium, potassium) in soil samples
2. Experimental verification of Beer-Lambert’s law

BAG

1. Determination of primary productivity aquatic habitats

MM

1. Determination of primary productivity in terrestrial habitats

RN

1. Study of dose – effect relationships in important toxicants/pollutants
2. Study of leaf pigment by paper chromatography and TLC methods

ANK

1. Estimation of protein and carbohydrate content in biological samples

BAG

1. Collection and identification of the fish fauna of different aquatic habitats

NA

**DISCIPLINE CENTRIC ELECTIVE**

**ENS104DCE: Environmental Geoscience (04 credits)**

**Unit I: Earth science**

1. Origin and evolution of earth
2. Geological time scale
3. Earth surface processes
4. Geomagnetism: Magnetic and gravitational fields of the earth
5. Continental drift: Plate tectonics and Neo-tectonics

MM

**Unit II: Natural hazards and disaster management**

1. Concept and classification of natural hazards
2. Causes and environmental consequences of

a. Earth quakes and Tsunami b. Floods and droughts. c. Landslides

1. Risk assessment and vulnerability analysis
2. Disaster management: preparedness, response, rehabilitation and failures (case studies)
3. National disaster management policy

**Unit III: Marine systems**

1. Marine zones
2. Composition of seawater
3. Marine resources and their recycling
4. Ice sheets and fluctuations of seawater
5. Ocean conveyor belt

AT

**Unit IV: Geochemistry**

1. Geochemical classification and distribution of elements in earth
2. Mobility of trace elements
3. Concept of rare earth elements
4. Geochemical cycles - C, N, P, S
5. Concept of residence time and rate of natural cycles

**ENS105DCE: Environmental Toxicology (04 credits)**

**Unit I: Principles of toxicology**

1. Definition, scope, goals and divisions of toxicology
2. Factors influencing toxicity, toxicity of chemical mixtures

RN

1. Factors affecting environmental concentration of toxicants,
2. Dose - response relationship
3. Toxicity testing methods (single & rnulti species, acute, sub-acute and chronic toxicity)

**Unit II: Biotransformation of xenobiotics**

1. Membranous barriers, binding, storage and absorption of xenobiotics
2. Excretion of xenobiotics

BAG

1. Biotransformation: General principles and types of biotransformation
2. Cytochrome P 450, its variants and their role
3. Glutathione – S- transferase, its variants and their role

**Unit III: Bio-magnification of xenobiotics**

1. Bioaccumulation, bioconcentration and biomagnification - study methods (microcosm)
2. Compartment models

RN

1. Bioassay and its applications in toxicology
2. Antidotal procedures in toxicology
3. Chemical safety evaluation

**Unit IV: Toxicants as public health hazard**

1. Pesticides and heavy metals.
2. Radioactive substances and food additives

NA

1. Automobile emissions.
2. Occupational diseases: Principles and methods of occupational health.
3. Evaluation and control of occupational health hazards.

**ENS106DCE: Mountain Ecology (02 credits)**

**Unit I: Mountains ecology**

1. Mountain ecosystem: Goods and services
2. Major mountains systems of the world: Himalayas, Alps, Andes
3. Ecological specializations in high altitude ecosystems
4. Impacts of climate change on mountain ecosystems
5. Mountain policy support: Land use dynamics, poverty and food security

GAB

**Unit II: Himalayan resources**

1. Glacier resources
2. Forests and forestry
3. Medicinal plants
4. Flora and fauna of Jammu & Kashmir
5. Energy resources of Jammu & Kashmir (Hydel and Solar)

**ENS107DCE: Human and Environment (02 credits)**

**Unit I: Environmentalism**

1. Environmentalism: Concept and history
2. Environmental organizations (WWF, UNEP, IUCN, WHO)
3. Environmental movements in India: Narmada dam, Tehri dam, Almatti dam and Chipko
4. The monetization frontier
5. Environmental politics

KM

**Unit II: Environmental education and psychology**

1. Environmental education
2. Environmental protection and religious teachings
3. Public awareness and role of NGOs
4. Environmental psychology and current problems
5. Environmental ethics

**GENERIC ELECTIVE**

**ENS108GE: Basics of Ecology and Environment (2 credits)**

**Unit I**

* 1. Importance of environment
  2. Components of environment-Atmosphere, hydrosphere, lithosphere and biosphere
  3. Human and environment relations
  4. Environment and development

MAJ

* 1. Tools for environmental management

**Unit II**

* 1. Structure and functions,
  2. Natural and managed ecosystem
  3. Ecosystem goods and services
  4. Ecological Succession
  5. Ecological Interactions

**ENS109GE: Biogeography (2 credits)**

**Unit 1**

* 1. Biodiversity and its importance
  2. Threats to biodiversity

AJ

* 1. Hotspots of Biodiversity
  2. Major biomes of the world: Distribution and characteristic features
  3. Biogeography: Processes and patterns

**Unit II**

* 1. Geographical classification and zones
  2. Zoogeographic realms of the world: Palaearctic, Nearctic, Neotropical, Oriental, Australian and African

AT

* 1. Dispersal: Means, modes and barrier
  2. Migrations
  3. Conservation Biogeography

**OPEN ELECTIVE**

**ENS110OE: Environmental Ethics and Sociology (2 Credits)**

**Unit I**

1. An introduction to environmental ethics and philosophy
2. Ethics in society

KM

1. Responsibility for environmental degradation
2. Theories of environmental ethics and philosophy
3. Resource consumption patterns and the need for equitable utilization

**Unit II**

1. Role of agriculture in socio-economic development
2. Land reforms and Bhoodan movement in India

AT

1. Community development projects
2. Rural social structure
3. Ecological theories of urbanization and urban social problem