71 ENVIRONMENTAL SCIENCES

Unit 1

Definition and scope of environmental science and its interrelationship with other sciences and agriculture; Segmentsatmosphere: hydrosphere, Lithosphere and biosphere; Components of environment - biotic, abiotic and social; Ecological Foot prints.Natural resources: land, soil, water and forest and; present status - Land degradation – Wasteland: their extent, characteristics and reclamation; water conservation : watershed management and rain water harvesting - Major river projects and its impacts; Mineral resources - Environmental effects of mining; Food resources – problems; Ecology concepts – types – habitat ecology, systems ecology, synecology, autecology; Ecosystem: Structure- Functions; Population -characteristics and measurement; Communities - habitats, niches, biomes, population dynamics, species and individual in theecosystem; Recent trends in ecology; Characteristic features - structure and function of forest,grassland, plantation, desert; Aquatic and agro-ecosystem. Energy flow in ecosystems and environment; Energy exchange and productivity-food chains and food webs-ecological pyramids; Ecological succession - types and causes. Biogeochemical cycles; nutrient cycles and recycle pathways.

Unit 2

Biodiversity concepts, levels and types, Values and Significance of biodiversity; Theories on biodiversity; Agro-biodiversity – Transgenic crops and animals – Impact on Environment. Plant genetic resources, exploration and collection; Biogeographical zones of India;Biodiversity hot spots in India and world; Loss of biodiversity – Causes - Crop domestication, plant introductions - exotics and invasive plants - IUCN clauses and concept of threatened and endangered species; - Methods of conservation - *in-situ* and *ex-situ*-national parks, wildlife sanctuaries,
biosphere
reserves; National and global conservation measures - institutions and conventions - Indian Biodiversity Act 2002; World heritage sites; Wetlands – Mangroves – Ramsarconvention.

Unit 3

Environmental Pollution - Point and non-point sources - Atmosphere – stratification - Composition of air-; Air pollution: sources and classification - Criteria pollutants - Indoor and out-door air pollution,; Types - primary and secondary pollutants – Thermal Inversion - Air pollution Episodes -Air Quality standards –Greenhouse gases – Global warming – Ozone depletion – Acid rain – Impacts on Environment - Effects of air pollutants on vegetation, animals and human health; mitigation measures for combating air pollution; Automobile pollution, Noise pollution-sourceand effects, Disasters and their management: floods, droughts, earthquakes; Tsunami, cyclones and landslides; Adaptation and mitigation strategies of climate change - Carbon sequestration and clean development mechanism. National and international laws and policies on air pollution. Environmental treaties; Role of NGO's in environmental protection; Corporate Social. Responsibility (CSR) of industries in environmental protection; Advance tools

for ecosystem analysis – Remote Sensing (RS) and Geographic Information Systems (GIS). EIA and Environmental Auditing.

Unit 4

Urban and Industrial wastewater - Pollution ofponds, lakes, rivers and ground water. Impacts of water pollutants on Environment- Effluent Treatment Processes –Energy production recycling of treated wastewaterand value addition to wastes -Permissible limits.
Soil pollution - sources - Organic and inorganic contaminants, Xenobiotics and their effect on agriculture: Heavy metals and pesticides -Effects of pollutants on soil health and productivity; Radioactive pollutants – Impacts; Remediation of contaminated soil – Microbial, chemical ameliorants, phytoremediation and Nano remediation; Permissible limits of organic and inorganic pollutants.

Unit 5

Solid waste – sources – Categories - hazardous and non-hazardous - impact on Environment – Management strategies – 5 R concepts - Thermal conversions – Pyrolysis – Gasification – Incineration;Biodegradation of organic wastes - Composting, Vermicomposting, Mushroom production,SCP; Energy recovery- biogas, landfill, etc. E- waste - impacts and resource recovery; Solid waste management rules in India.

Unit 6

Energy - Types -of renewable sources of energy; Solar energy: Energy transfer and applications- Solar thermal system and their applications Wind energy –Types Geothermal and tidal energy; Bioenergy from biomass
Liquid fuels from petro crops,-
Concepts of producer gas; types of
gasifiers; Briquetting of agro-wastes for fuel; Potential of renewable energy sources in India, Integrated rural energy programme;
Nuclear energy–

Unit 7

Frequency distribution, mean, median, mode and standard deviation; Normal, binomial and poisson distribution;
Correlations - partial and multiple; Regression coefficients and multiple regression. Tests of significance F and Chisquare
(X2) tests; Experimental designs - basic principles, completely randomized, randomized block, Latin square and split plot designs.