Syllabus for Combined Educational Services

ENVIRONMENTAL SCIENCE

Full Marks : 200 marks

Objective type: 100marks

Descriptive type: 100marks

Unit I: Fundamentals of environmental science

Introduction to environmental science ; multi – disciplinary nature of environmental science; Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere; natural resources and their conservation; Environmental education and awareness; Environmental ethics. Natural Resources: Air, Water, Soil, Minerals, Forests and Energy resources; Concept of reserve and resources; Problems with the exploitation of resources. Energy Fundamentals: Heat transfer processes; hydrologic cycle and biogeochemical cycles.

Unit II: Environmental Chemistry

Concept and scope of Environmental Chemistry; Acid base reactions, Oxidation and reduction; Atmospheric Chemistry; Chemical processes in the form of organic and inorganic particulate matters- smog, PAN, acid rain, ozone depletion, Soil & Water Chemistry: Chemical & mineralogical composition of soil; Physical properties of soil; Geochemistry; Toxic chemicals; Principles of analytical methods. Titrimetry, Gravimetry, Bomb Calorimetry, Chromatography

Unit-III: Environmental Biology

Ecology as an inter-disciplinary science; Origin of life and speciation; Human Ecology and Settlement; Ecosystem Structure and functions; Basis of Ecosystem classification; Energy flow in an Ecosystem, Food chains and Food webs, Ecological pyramids, Ecological succession; Concept of ecotone, edge effect, ecological habitats and ecological niche; Population ecology; Community ecology.

Unit IV : Environmental Geosciences

Origin of the earth. Primary differentiation and formation of core, mantle, crust, atmosph ere and hydrosphere; Weathering, erosion, transportation and deposition of earth's materials by running water, wind and glaciers; Concept of steady state and equilibrium; Climates of India, western disturbances, Indian monsoon, droughts, El Nino, La Nina. Earth's process; Rocks and rock types - Igneous, Metamorphic and Sedimentary; Composition and formation, Soil and soil formation process, composition and classification; Soil profile; Soil types of India; Mineral deposits - formation and classification; Natural Hazards: Catastrophic geological hazards -

floods, landslides, earthquakes, volcanism, avalanche, tsunami and cloud bursts. Prediction of hazards and mitigation of their impacts.

Unit-V: Energy and Environment

Introduction; Energy resources and their exploitation; Non- conventional sources of energy; Conventional sources of energy, bio-energy: Conversion processes - pyrolysis, charcoal production, compression, gasification and liquefaction; environmental implications of energy use; Energy consumption patterns-India and the world; Problems and solution in energy conservation; Nuclear energy-fission and fusion; Nuclear fuels.

Unit-VI: Environmental Pollution

Definition; Classification of pollutants and their global, regional and local aspects; Definition, Causes, effects and control measures of Air Pollution; Water pollution; Soil pollution; Noise pollution; Marine Pollution; Thermal Pollution and Radioactive pollution; Treatment of water and waste water; Indian standards for drinking water; Eutrophication; Indian National Ambient Air Quality Standards; Indian standards for drinking water (IS:10500, 2012); Role of individual in prevention of pollution;

Unit-VII: Solid and Hazardous Waste Management

Solid Waste management: Solid Waste - types and sources. Solid waste characteristics, Solid waste collection and transportation, Solid waste processing and recovery – Recycling, recovery of materials for recycling and direct manufacture of solid waste products. Electrical energy generation from solid waste, composting and vermicomposting, biomethanation of solid waste. Disposal of solid wastes – sanitary land filling and its management, incineration of solid waste; Hazardous waste – Types, characteristics and health impacts. Hazardous waste management: Treatment Methods – neutralization, oxidation reduction, precipitation, solidification, stabilization, incineration and final disposal; E-waste: classification, methods of handling and disposal; Fly ash: sources, composition and utilization; Plastic waste: sources, consequences and management.

Unit-VIII: Environmental Assessment, Management and Legislation

Aims and objectives of Environmental Impact Assessment (EIA);Environmental Impact Statement (EIS) and Environmental Management Plan (EMP); Overview of Environmental Laws in India: Environmental protection Act: Air and Water prevention and control of pollution Act, Wildlife protection Act, Forest conservation Act; Issues involved in enforcing of environmental legislation; Environmental Conventions and Agreements: Stockholm Conference on Human Environment 1972, Montreal Protocol, 1987, Conference of Parties (COPs), Basel Convention (1989, 1992), Ramsar Convention on Wetlands (1971), Earth Summit at Rio de Janeiro, 1992, Agenda-21, Global Environmental Facility (GEF), Convention on Biodiversity (1992),

UNFCCC, Kyoto Protocol, 1997, Clean Development Mechanism (CDM), Earth Summit at Johannesburg, 2002, RIO+20, UN Summit on Millennium Development Goals, 2000, Copenhagen Summit, 2009. IPCC, UNEP, IGBP.

Unit – IX: Biodiversity and its conservation:

Concepts and components of biodiversity; Biodiversity at the global, national and local level; Hotspots in India; India as a megadiversity nation; Biogeographic classification of India, Values of biodiversity: direct and indirect values; Threats to biodiversity; strategies for biodiversity conservation: in-situ and ex-situ conservation, in-vitro conservation; vulnerability of species to extinction; Concept gene pool, National Red data book, Concept of restoration ecology. International efforts and issues of sustainability; Wildlife values and eco-tourism; wildlife distribution in India; problem in wildlife protection; role of WWF, WCU, CITES and TRAFFIC.

Unit-X: Contemporary Environmental Issues

Global Environmental Issues – Biodiversity loss, Climate change, acid rain, Ozone layer depletion, Sea level rise, International efforts for environmental protection; National Action Plan on Climate Change(Eight National missions)

Carbon sequestration and carbon credits. Waste Management – Swachha Bharat Abhiyan. Sustainable Habitat: Green Building, GRIHA Rating Norms. Vehicular emission norms in India. Epidemiological Issues: Fluorosis, Arsenocosis, Goitre, Dengue. Environmental Disasters: Minnamata Disaster, Love Canal Disaster, Bhopal Gas Disaster, 1984, Chernobyl Disaster, 1986, Fukusima Daiichi nuclear disaster, 2011.

Climate change - adaptability, energy security, food security and sustainability. Forest Conservation – Chipko movement, Appiko movement, Silent Valley movement and Gandhamardhan movement. People Biodiversity register.

Current Environmental Issues in India: Environmental issues related to water resource projects, Water conservation-development of watersheds, Rain water harvesting and ground water recharge. National river conservation plan. Eutrophication and restoration of lakes. Conservation of wetlands. Soil erosion, reclamation of degraded land, desertification and its control. Climate change - adaptability, energy security, food security and sustainability. Forest Conservation Wild life conservation projects.

Digitally signed by THEPFURIENYU GEORGE KIRE
DN: c=IN, o=Personal, pseudonym=6f0555d303eea81241e28979204affcdb804731d5764c3d4ab82dc94c7eba8a1, postalCode=797112, st=NAGALAND, serialNumber=2fd12110ef9983df9d6f92600e1bf08ef5d5e498ee5e4390a41134cb11ee19cc, cn=THEPFURIENYU GEORGE KIRE
Date: 2021.07.30 15:30:01 +05'30'