Ph.D. Programme in Environmental Science

ENTRANCE EXAMINATION (GPTR 2020)

Syllabus of Research Methodology

Nature and Purpose of Research: Meaning of research, aim, Nature and scope of research, Pre-requisites of research, Types of research: Exploratory, descriptive and experimental

Research Problem: Types of research problem, Characteristics of a good research problem; Hypothesis: Meaning and types of hypothesis, Research proposal or synopsis

Research Methods: Qualitative and Quantitative

Review of Literature: Purpose of the review; Identification of the literature; Organizing the literature

Data Collection and Analysis: Types of data, Methods of data collection, Sample and Population; Sampling Techniques; Characteristics of a good sample; Tools of data collection: Observation method, Interview, Questionnaire, Various rating scales, Characteristics of good research tools

Descriptive Statistics: Tabulation, Organization, and Tabulation and Graphical representation of Quantitative data; Measure of Central tendencies: Mean, Median, Mode; Measures of Variability: Range, Quartile Deviation, Standard Deviation, and Coefficient of Variation. Normal Probability Distribution: Properties of normal probability curve, Skewness and Kurtosis, Data analysis with Statistical packages (MS-Excel, SPSS), Hypothesis Testing, Generalization and Interpretation

Research Report: Structure and Components of Research Report; Types of Report, Characteristics of good research report; Bibliographical entries, Research ethics

SYLLABUS OF SUBJECT AWARENESS FOR Ph.D. IN ENVIRONMENTAL SCIENCE ENTRANCE EXAMINATION (GPTR-2020)

UNIT-I

Earth Environment - Ecosphere and its components (atmosphere, hydrosphere, lithosphere (geosphere) and biosphere), Global (climate change, biodiversity loss, acid rain, depletion of ozone layer and pollution of international waters) and national (Indian) environment issues

Environmental Factors- Physical (Light, temperature, pressure, precipitation and wind). Chemical (gases and pollutants) and Biological (aerospora and pathogens)

Ecology- An interdisciplinary science and its importance

Ecosystem- Concept, types and importance; Structure-trophic levels, homeostasis, food transfer (food chain and web, detritus pathway); Functions (biogeochemical cycles-C, N, P and S) and energy flow (Laws of thermodynamics, pathway of energy), Ecological pyramids; Ecosystem perturbations (grazing, browsing, trampling, burning and industrialization)

Population- Definition, characteristics, population growth

Ecological Succession- Definition, Types, Mechanism of succession

Biomes- Concept, classification and distribution; Major terrestrial biomes, fresh water ecosystems, Marine ecosystems

UNIT-II

Environmental Chemistry: Classification of elements, stoichimetry, Gibb's energy, Chemical Bonding, Chemical reactions and equations

Atmospheric Chemistry: Thermo-chemical and photo-chemical reactions in atmosphere, Oxygen and ozone chemistry, photochemical smog

Aquatic Chemistry: Chemistry of natural waters (fresh water and marine), physico-chemical properties of water

Chemistry of Toxic Products: Pesticides-Classification and their effects, Heavy metals - Bio-chemical aspects of heavy metals, Carcinogens in air

Soil Properties: Physical properties; Soil texture and structure, bulk density, pore space, soil air, soil temperature, soil water; Chemical properties- Soil colloids, Soil organic matter; Biological properties of soil

Soil Conservation: Soil erosion and soil conservation; Desertification-definition, factors causing desertification, desertification control; Biofertilizers

UNIT-III

Air Pollution: Sources and types of air pollutants; Impact of air pollutants on human health, plants, animals and materials; Control of air pollution

Noise Pollution: Sources; Impact of noise and vibrations on human health; Noise control and abatement measures

Water Pollution: Types and sources, eutrophication-concept, causes, effects and control measures; Impact of water pollution on humans, plants and animals; Wastewater treatment- primary, secondary and advanced treatment methods

Marine Pollution: Sources and factors responsible for marine pollution, effects of marine pollution, control of marine pollution

Soil Pollution: Sources (agricultural, industrial, mining and dumping) of soil pollution; Effect of soil pollution; Incidences of fluorosis, arseniosis and goitre in India; Control of soil pollution

Radioactive Pollution: Sources, biological effects and health hazards associated with radiation, control of radioactive pollution

Thermal Pollution: Sources, Heat islands-causes and consequences, Chemical and biological effects of thermal pollution, control of thermal pollution

UNIT-IV

Biodiversity- Concept, types, National (Indian) and global status of biodiversity; threats to biodiversity, Invasive species

Biodiversity Hotspots- Definition and basis of identification, global occurrence

Biodiversity Conservation- *In-situ* conservation practices-protected area network (Preservation plot, National park, Wildlife Sanctuary, Conservation reserve, Community reserve, On-farm conservation and Biosphere reserve); *ex-situ* conservation practices-Botanic garden, homestead garden, Arboratum, Bamboosetum, fernaria, Cacteria, herbarium, Zoo, Aquarium, and *in-vitro* conservation practices-gene bank, cryobank (pollen and spore bank) and DNA library

Sustainable Development (SD): Concept; Sustainable Development Goals

UNIT-V

Waste - Definition and categories; Sources; Concepts of waste reduction, 3R and 5R concept

Waste Treatment Technologies Incineration, Composting, Vermi-composting, Waste disposal in landfills

Hazardous Wastes - Definition, sources and characteristics; e-waste, Fly ash, Plastic waste