

## **SYLLABUS FOR INTEGRATED PhD ENTRANCE (2018)**

### **101. Fundamentals of Environmental Science**

1. Definition, principle and scope of environmental science
2. Atmosphere: Structure and composition
3. Hydrosphere and cryosphere: Hydrological cycle
4. Lithosphere: Structure and composition
5. Biosphere: Components
6. Structure and function of ecosystems
7. Ecosystem resilience
8. Primary productivity
9. Secondary productivity
10. Energy flow, energy models and energy relations in ecosystems
11. Characteristics of population
12. Population growth and population interactions
13. Population regulation: Density dependent and density independent
14. Concept and characteristics of communities
15. Ecological succession, primary and secondary processes in successions, climax community and types of climax
16. Meteorological parameters: Atmospheric pressure, temperature, precipitation, humidity and wind
17. Radiation and heat budget
18. Atmospheric stability
19. Temperature inversions
20. Wind roses

### **102. Environmental Chemistry**

1. Stoichiometry
2. Titrimetry and gravimetry
3. Potentiometry (pH and conductivity)
4. UV-visible and flame photometry
5. Atomic absorption spectrophotometry
6. Formation and evolution of earth's atmosphere
7. Ions, radicals and particulates in the atmosphere
8. Formation of inorganic and organic particulate matter
9. Thermo-chemical and photochemical reactions in the atmosphere
10. Chemistry of green house gases
11. Physico-chemical characteristics of water
12. Solubility of gases in water; dissolved gases in water - CO<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>S, CH<sub>4</sub> and NH<sub>3</sub>
13. Biochemical oxygen demand and chemical oxygen demand
14. Carbonate-bicarbonate system
15. Redox potential
16. Soil profile and pedogenesis



17. Inorganic and organic components of soil
18. Physico- chemical properties of soils
19. Biochemical properties of soil
20. Soil classification and types

### **103.Environmental Pollution and its Control – I**

1. Sources, classification and properties of primary and secondary air pollutants
2. Pollutant's behaviour in atmosphere
3. Smog and acid rain
4. Ozone layer depletion
5. Global warming and climate change
6. Indoor air pollution and its control: smoke, HCs, particulate matter, radon
7. Air quality standards and monitoring of air pollution: SO<sub>x</sub>, NO<sub>x</sub>, CO, SPM and hydrocarbon
8. Control of particulate and gaseous air pollution - SO<sub>x</sub>, NO<sub>x</sub>, CO
9. Control of green house gases
10. Bio-filters for control of air pollution
11. Noise pollution: definition and sources
12. Measurement of noise
13. Equivalent sound pressure level (Leq), noise pollution level (NPL), sound exposure level (SEL), traffic noise index (TNI), day-night level (DNL), noise criteria curves
14. Impact of noise on human health and environment
15. Noise control and abatement measures
16. Thermal pollution: causes and consequences
17. Control of thermal pollution
18. Radioactive pollution: causes and consequences
19. Types of radioactive pollutants and their sources
20. Radioactive waste management and control

### **104.Environmental Pollution and its Control – II**

1. Land degradation and soil pollution: causes and types
2. Desertification: causes, consequences
3. Soil erosion: causes, assessment and environmental impacts
4. Impact of pesticides in soil
5. Industrial waste effluents and heavy metals and their interaction with soil components
6. Control of soil pollution
7. Soil conservation and control of soil erosion
8. Waste lands and their reclamation
9. Sustainable agricultural practices
10. Integrated pest management
11. Sources and types of water pollution
12. Lake eutrophication and stream pollution
13. Petroleum hydrocarbons and marine pollution
14. Ground water pollution



15. Biocides, heavy metals and their impact on aquatic life
16. Water and waste water standards
17. Control of eutrophication and restoration of lakes and wetlands
18. Role of microbes in pollution abatement
19. Role of aquatic plants in pollution abatement
20. Control of Stream and groundwater pollution

### **105. Natural Resources**

1. Classification of mineral resources
2. Metals and minerals from land and their global distribution
3. Metals and minerals from oceans and their global distribution
4. Metals and mineral deposits in India with special reference in J&K
5. Environmental consequences of mineral exploitation
6. Inventory of earth's water resources: Surface and groundwater
7. Water resources of India with special reference to Kashmir
8. Global water budget
9. Surface and ground water resources: Global consumption pattern
10. Water resource management
11. Animal resources: current status with special reference to India
12. Fishery resources of India with special reference to J&K
13. Plant resources
14. Forest resources of India: Timber and non timber
15. Rangelands
16. Renewable energy resources
17. Non-renewable energy Resources
18. Nuclear energy
19. Concept of green fuels
20. Hydrogen as a source of energy

### **106. Environmental Impact Assessment**

1. Environment impact assessment: Concept, objectives and approaches
2. Strategic environmental assessment
3. EIA guidelines 2006 and amendments
4. Protocol for environment impact statements
5. Public participation in environmental decision making
6. EIA methods
7. Baseline data generation
8. Air and water quality assessment
9. Ecological assessment
10. Social impact assessment
11. Hydro power, irrigation and drainage
12. Industrial estates and Parks
13. Highways and Railways



14. Thermal power projects
15. Cement and Chemical industries
16. Role of models in ecology
17. Components of a model
18. Classes of mathematical models
19. Models of population (growth and interaction) and pollutant dispersal
  - Lotka – Volterra model
  - Leslie's matrix model
  - Gaussian plume model
20. Modeling of air quality, water quality and noise characteristics

### **107. Environmental Engineering**

1. Environmental engineering: Introduction and scope
2. Sewage and storm water drainage
3. Planning of housing drainage
4. Environmental sanitation
5. Ventilation and air conditioning
6. Methods of water purification: flocculation, sedimentation, sedimentation with coagulation
7. Filtration: sand filters, pressure filters, horizontal filters
8. Disinfection and desalination of water
9. Chemical treatment: adsorption, gas stripping, ion exchange
10. Reverse osmosis and distillation
11. Wastewater treatment plants: Concept, methods and design
  - Primary
  - Secondary
  - Tertiary
12. Sludge and its disposal techniques
13. Natural methods of sewage disposal
14. Biology of sewage treatment
15. Reclamation and reuse of industrial and domestic wastewater
16. Solid wastes: sources, generation and their characteristics
17. Hazardous waste: sources and generation and their characteristics
18. Disposal and management of solid, industrial and hazardous wastes,
19. Hospital waste management
20. Site remediation

### **108. Biodiversity and Resource Management**

1. Geographical classification and zones
2. Major biomes of the world: Distribution and characteristic features
3. Zoogeographic realms of the world: Palaeartic, nearctic, neotropical, oriental, australian and african
4. Dispersal: Means, modes and barriers, island life
5. Migrations



6. Biodiversity: Status and importance, India as a mega-diversity nation
7. Endemism: Factors controlling distribution of flora and fauna
8. Hot Spots and cold spots, concept of native and exotic species
9. Biodiversity decline: Drivers of change and pressures
10. Threatened species categories of IUCN; concept of extinction threshold and extinction debt
11. Forest conservation: social forestry and joint forest management
12. Management of rangelands
13. Fishery resource management
14. Monitoring and management of bio-diversity
15. 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
16. Concept and strategies of sustainable development
17. Management of mineral resources
18. Management of fresh water resources
19. Energy crisis and conservation of energy resources
20. Concept of ecological footprint and carbon sequestration