**J.T.S.S.P.M’S**

**Shri Shiv Chhatrapati College, Junnar**

**UGC Sponsored Certificate Course in**

**Environmental Protection**

**Syllabus**

1. **Theory**

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| **Unit -I** | **Introduction to Environment and Ecosystem** | **15 L** |
| 1.1 | The multidisciplinary nature of environmental studies – Definition, scope and importance need for public awareness. |  |
| 1.2 | Our environment -Atmosphere, Hydrosphere, Lithosphere, Scope of Ecology. |  |
| 1.3 | Concept of an Ecosystem – Structure and function of ecosystem, Producer, Consumers and Decomposers. |  |
| 1.4 | Energy Flow in the Ecosystem – Ecological Succession. |  |
| 1.5 | Food chain, Food Webs and Ecological Pyramids – Introduction, Types, Characteristics Features. |  |
| 1.6 | Structure and Function of –  A) Forest Ecosystem  B) Grassland Ecosystem  C) Desert Ecosystem  D) Aquatic Ecosystem ( Ponds, Streams ,Lakes, Rivers , oceans , Estuaries) |  |
| **Unit -II** | **Biodiversity** | **20 L** |
| 2.1 | Introduction to Biodiversity – Definition, Genetics, Species and Ecosystem Diversity. |  |
| 2.2 | Biogeographically Classification of India – Biodiversity at Local Global and National Levels. |  |
| 2.3 | Value of Biodiversity – Consumptive use, Productive use, Social, ethical and Aesthetic values . |  |
| 2.4 | Conservation of Biodiversity. |  |
| 2.5 | Molecular Methods of Characterisation of Biodiversity – Introduction to Biodiversity Database, Global biodiversity information system. |  |
| 2.6 | Indian Forest and Vegetation type and diversity of flora and fauna. |  |
| 2.7 | Endangered and Endemic Species, Threatened species, Categories of IUCN, threatened species of plants and animals in India, Red Data books. |  |
| 2.8 | India as a Mega- Diversity Nation, Hot spots of biodiversity – Threats to Biodiversity, Habitat Loss, Poaching of wildlife, Man wildlife conflicts. |  |
| 2.9 | Biodiversity Conservation – In-situ and Ex- situ conservation of biodiversity.  Biodiversity (Protection) Act -2002, Wildlife (Protection) Act 1972 of India.  Conservation of Tiger Reserves, National Park and Sanctuaries. |  |
| 2.10 | Natural Resources – Types – Forests types ,Uses, deforestation ,Natural resources and their conservation ,Problems with exploitation of resources , equitable use of resources for sustainable lifestyles. |  |
| 2.11 | Introduction to Taxonomy – Taxonomic Principles, Procedure of Classification, Linean classification of animals up to the generic groups. |  |
| 2.12 | Biological Relationship – Neutralism, Symbiosis, Commensalism, Mutualism, Parasitism, Predatism, Competition – intra specific and inter specific. |  |
| **Unit -III** | **Environmental Biotechnology** | **15 L** |
| 3.1 | Introduction to environmental biotechnology, engineered system for air pollution control , control devices for particular contaminants – gravitational settling chamber , cyclones ,wet collectros, electrostatics precipitators etc. |  |
| 3.2 | Bioremediation – Waste water treatment, conventional waste water treatment procedures (STP and ETP), biological treatment system (Aerobic and Anaerobic), Biomethanation process. |  |
| 3.3 | Solid waste management – Sources and classification, Majors types of solid waste treatment processes, land filling, sanitary land filling, hazards of land filling . |  |
| 3.4 | Composting (aerobic and anaerobic) Vermicomposting and incineration as a methods of solid waste disposal. |  |
| 3.5 | Energy of biomass, bacterial biofertilizers. |  |
| **Unit -IV** | **Environmental Chemistry, Ecotoxicology and Environmental Techniques** | **15 L** |
| 4.1 | Definition Concept and Scope of environmental chemistry, Chemical composition of air, sources and effects of air pollutants on living and non –living things. |  |
| 4.2 | Chemistry of water – Physical properties of water, water and water quality parameters, Effects of water pollution. |  |
| 4.3 | Chemistry of soil - Formation ,Constituents and properties of soils , types of soil, chemical factors affecting the soil quality . |  |
| 4.4 | pesticides – fertilizers effect of modern agro- technology on quality of soil , sampling of air and water pollutants. |  |
| 4.5 | Absorption and distribution of toxicants in animal body, Bio-magnification, Bio- accumulation. |  |
| 4.6 | UV and Visible spectroscopy, Flame Photometry. |  |
| 4.7 | TLC , Paper, column , Ion exchange Chromatography. |  |
| 4.8 | Theory and application of Polyacrylamide and Agarose gel electrophoresis. |  |
| 4.9 | Types of centrifuge – Simple, Micro-centrifuge, High speed and Ultracentrifuge, Application (Isolation of cell components). |  |

1. **Practicals**

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| **Sr. No.** | **Practicals** |
|  | To study general laboratory practices. |
|  | To study different instruments used in environmental microbiology. |
|  | To study pH of given water and soil sample. |
|  | To estimate total hardness of given water sample. |
|  | To study planktons from given water sample. |
|  | To estimate sulphate content from given water sample. |
|  | To estimate phosphate content from given water sample. |
|  | To estimate chlorides from given water sample. |
|  | To estimate dissolved oxygen from given water sample. |
|  | Analysis of metals from water. |
|  | Colorimetric estimation of nucleic acid (DNA and RNA). |
|  | To study preparation of nutrient media. |
|  | To isolate micro-organisms from air and water samples. |
|  | To perform simple, negative and Gram’s staining of bacteria. |
|  | To estimate carbohydrate content from given sample. |
|  | To estimate protein content from given sample. |
|  | To estimate starch content from given sample. |
|  | To estimate free amino acids content from given sample. |
|  | To carry out bioremediation of metals by using biomaterial. |
|  | Field visit to forest/aquatic ecosystem / ETP / STP. |