

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ESC 205	Ecology and Environmental Microbiology	3	0	0	9

Course Objective

To understand the Fundamentals of Ecology and Microbiology and Importance of Microbiology in the Environment

Learning Outcomes

Upon successful completion of this course, students will:

- Understand the fundamentals and importance of ecology and microbiology in the environment
- Understand the application of microbial remediation in the environment

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	UNIT-I <i>Fundamentals of Ecology and Ecosystem</i> – Structural and Functional Components. Food chain & Food webs. Ecological pyramids; Energy flow. <i>Ecosystem Stability</i> - Inertia & Resilience, fragile ecosystem, Hot Spots; Aichi Target 15 & REDD+, Ecosystem services; NPV Ecosystems, and the Millennium Development Goals, Landscape ecology.	5	To understand the Fundamentals of Ecology
2	UNIT-II <i>Population and Community Ecology</i> - Characteristics and Structure, Population interaction; Population growth; Habitat; ecological niches and Ecotone. <i>Ecological Successions</i> - Trends of ecosystem development (structural and functional). Succession in land and water. System ecology; Energy flow in ecosystem- recycled pathway. Biogeochemical cycles; Nutrient cycling in tropics. Limiting factors- Liebig's law, Shelford's laws, Steno and Eury species. Bio-monitoring, pollution tolerant & sensitive species; Indicator species. <i>Biological diversity</i> -red data book species. Biodiversity indices; biodiversity conservation.	8	To understand the behavior of living organisms in the environment and also biodiversity amongst the living organism
3	UNIT-III <i>Aquatic ecology</i> - stratification, productivity, life forms, impacts of thermal discharge and reservoir de-watering. Marine and Estuarine ecosystem; Wetland ecosystem, Ecotoxicology- toxicity testing system, LC50, EC50, NOEC, LOEC, Eutrophication kinetics, phosphorus model. Pesticide and bioaccumulation.	4	To understand the behavior of aquatic organisms in the environment
4	UNIT-IV <i>Environmental importance of microbiology</i> - Classification, distribution of microbes, Nutrition, Enumeration of microbes, Bacterial growth curve, Batch culture, continuous culture, Effects of environmental factors on growth, Control of Microbes. Microbial Metabolism- Glycolysis, TCA, and ETC, Fermentation, Energy balance- Growth, Enzymes, metabolic pathways and intermediate products, Different kinetics model.	9	To understand the importance of microorganisms in the environment
5	UNIT-V <i>Water microbiology</i> -Analysis, waterborne diseases and pathogens, MPN and MFT test; fecal coliform and fecal streptococci; IMVIC test. <i>Air microbiology</i> - Microorganisms of air, Air-borne diseases and pathogens. <i>Soil Microbiology</i> -Microbial flora, soil borne pathogens, Bio-fertilizers, N-fixation, root nodule formation, VAM fungi, Bio-pesticides.	9	To understand the importance and behavior of microorganisms in the water, Air and soil environment
6	UNIT-VI] Concept of microbial remediation- Degradation of natural substances, Mechanism and Application; Microbial composting; Vermicomposting; Microbial applications for Bioenergy from waste.	7	To understand the application of microorganisms in the various pollutant removal

Recommended Text Books:

1. Fundamentals of Ecology (latest ed). Eugene P. Odum. WB Saunders Company, Philadelphia.
2. Fundamentals of Ecology- MC Dash. Tata-McGraw Hill, New Delhi.

Recommended References:

3. Microbiology - Michael J. Pelzer et.al., (latest ed.), Tata McGraw Hill, New Delhi.
4. Introduction to Environmental Engg. G.M. Masters. Prentice Hall of India