

Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	NESC501	Ecology and Environmental Microbiology	3	1	0	4

Course Objectives

Understanding the concept and importance of Ecology & Microbiology

Overall Learning Outcomes

Upon successful completion of this course, students will be able to:

- Understanding the fundamental applications of Ecology, biodiversity and microbiology for sustainable development.
- This course will provide the knowledge of ecological and microbiological aspects for applicable to the environmental research.
- The students will be able to understand the mechanism and kinetics of microbial remediation of the various environmental pollutants.

Unit No.	Topics to be covered	Contact Hr (L+T)	Learning outcomes
I	Fundamentals of Ecology and Ecosystem – Structural and Functional Components. Food chain & Food webs. Ecological pyramids; Energy flow. Ecosystem Stability- Inertia & Resilience, fragile ecosystem, Hot Spots; Aichi Target 15 & REDD+, Ecosystem services; NPV Ecosystems, and the Millennium Development Goals, Landscape ecology. Population and Community Ecology- Characteristics and Structure, Population interaction; Population growth; Habitat; ecological niches and Ecotone. Biodiversity- Conservations, Biodiversity Indices.	8+2	To understand the basic concepts of classical ecology
II	Biogeochemical cycling; C, N, P and S cycle, Nutrient cycling in tropics. Limiting factors, Shelford's laws, indicator species; Habitat, ecological niches and Ecotone. Aquatic ecology – stratification, productivity, life form; impacts of thermal discharge, Marine, Estuarine and Wetland ecosystem; Population and community; Ecological successions; trends of ecosystem development. Succession in land & water. Ecotoxicology: Background, importance & measurement; LC50, EC50, NOEC, LOEC, toxic units, ecosystem response to de-oxygenation, eutrophication – kinetics, lake phosphorous model, Pesticides & Bio- accumulation.	9+3	To understand the knowledge of Bio- geochemical cycles and ecotoxicology
III	Environmental importance of microbiology- 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. Water microbiology- Analysis, Water-borne diseases and pathogens, MPN and MFT test; faecal coliform and faecal streptococci; IMVIC test	9+3	To understand the basics of environmental microbiology
IV	Air microbiology-Microorganisms of air, Air-borne diseases and pathogens. Soil Microbiology-Microbial flora, soil borne pathogens, Bio-fertilizers, N- fixation, root nodule formation, VAM fungi, Bio-pesticides, Microbial composting; Vermicomposting	8+3	To understand the air and soil microflora and nutrient management
V	Concept of microbial remediation - Degradation of natural substances, Mechanism and Application; Microbial applications for Bioenergy from waste, microbial application in resource recovery.	8+3	To understand the advanced concept and applications of environmental microbiology
		42+14	

Text Books:

- 3.Fundamentals of Ecology (3rd Ed.) 2001- MC Dash, Tata - McGraw Hill, New Delhi.
- 4.Microbiology– M J Pelzer et. al - Tata McGraw Hill, New Delhi (1998).

Reference books:

4. Microbiology for Environmental Scientists & Engineers (1980) – AF Gaudy, and ET Gaudy, MGH, NY.
 5. Environmental Microbiology: editors; Ian Pepper, Charles Gerba, Terry Gentry, Academic Press, 2014.
 6. Environment & Ecology - A Complete Guide. R Rajgopalan, Lexis Nexis, 2017.
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