

Branch Name:	M.Sc. Biotechnology / Microbiology
Program Code:	SC201 / SC202
Course Name:	Applied Ecology and Sustainable Development
Course Code:	3SC2000104
Pre-requisite Course:	

Course Objectives:

- Understand fundamental ecological principles and ecosystem functioning.
- Learn population dynamics, biodiversity, and ecological interactions.
- Recognize environmental pollution and global ecological challenges.
- Develop awareness of natural resource conservation and sustainability.
- Understand wildlife conservation and biodiversity management strategies.
- Apply ecological knowledge to address environmental problems.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
4	--	--	4	50	50	--	--	100

Subject Contents:

Unit	Content	Lectures	Weightage
1	Fundamentals of Ecology Definition, scope, and branches of ecology Levels of organization: organism → population → community → ecosystem → biosphere Abiotic factors: light, temperature, water, soil Biotic interactions: mutualism, commensalism, parasitism, predation, competition Ecosystem structure and function Energy flow in ecosystems (food chains, food webs, ecological pyramids) Biogeochemical cycles: water, carbon, nitrogen, phosphorus	15	25%
2	Population and Community Ecology Population characteristics: density, natality, mortality, dispersion Population growth models: exponential and logistic growth Population regulation and carrying capacity Community structure and succession (primary and secondary succession) Ecological niches and species interactions Biodiversity: types (genetic, species, ecosystem) and significance	15	20%
3	Environmental Pollution and Conservation Types of pollution: air, water, soil, noise, radioactive Sources, effects, and control measures of pollution Climate change, global warming, ozone depletion, acid rain Conservation of natural resources: water, soil, forest, minerals Sustainable development and environmental management Environmental laws and policies (India and global overview)	15	30%
4	Wildlife Conservation and Applied Ecology	15	25%

	Wildlife of India and biodiversity hotspots Threatened species: IUCN categories, causes of extinction In-situ and ex-situ conservation strategies National parks, wildlife sanctuaries, biosphere reserves Human-wildlife conflict and management Role of NGOs and community participation Ecological restoration and conservation strategies		
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Textbooks:

- Sharma, P. D. (2017). Ecology and Environment (13th ed.). Rastogi Publications.

Reference Books:

- Atlas and Bartha, Microbial Ecology
- Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.
- Agarwal, K. C. (2010). Environmental Biology. Nidi Publishers.
- Sharma, P. D. (2017). Ecology and Environment (13th ed.). Rastogi Publications.
- Rajagopalan, R. (2016). Environmental Studies: From Crisis to Cure (3rd ed.). Oxford University Press India
- Odum, E. P., & Barrett, G. W. (2005). Fundamentals of Ecology (5th ed.). Brooks/Cole.
- Krebs, C. J. (2016). Ecology: The Experimental Analysis of Distribution and Abundance (6th ed.). Pearson.
- Begon, M., Townsend, C. R., & Harper, J. L. (2006). Ecology: From Individuals to Ecosystems (4th ed.). Blackwell Publishing.
- Cunningham, W. P., & Cunningham, M. A. (2019). Environmental Science: A Global Concern (15th ed.). McGraw-Hill.

List of Open-Source Software/learning website:

- <https://www.youtube.com/watch?v=GlnFylwdYH4>
- <https://www.khanacademy.org/science/biology/ecology/intro-to-ecology/v/ecologyintroduction>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Define and explain fundamental ecological concepts, including ecosystem structure, energy flow, biogeochemical cycles, and ecological interactions.	1 Remember 2 Understand
CLO2	Explain, apply, and analyze population and community dynamics, including growth patterns, ecological succession, biodiversity, and species interactions.	2 Understand 3 Apply 4 Analyse
CLO3	Explain, apply, analyze, and evaluate the causes, impacts, and control measures of environmental pollution and global ecological issues such as climate change and resource depletion.	2 Understand 3 Apply 4 Analyse 5 Evaluate
CLO4	Apply, analyze, and evaluate principles of natural resource conservation and sustainable development in real-world environmental contexts.	3Apply 4 Analyse 5 Evaluate
CLO5	Explain, apply, analyze, and evaluate wildlife conservation strategies, including biodiversity protection, habitat management, and conservation policies at national and global levels.	2 Understand 3Apply 4 Analyse 5 Evaluate

CLO6	Apply, analyze, evaluate, and design ecological conservation strategies by integrating scientific knowledge, environmental policies, and community-based approaches to address current environmental challenges.	3Apply 4 Analyse 5 Evaluate 6 Create
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Mapping of CLO s with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2	PSO3
CLO1	1	2			2	1								2			1	1	1
CLO2	1	2			2	2								2	2		1	1	
CLO3	3	2			2	3							2	3	2	2	1	2	2
CLO4	3	2			2	3							2	3	2	2	1	1	1
CLO5	3	2			2	3			1			1	2	3	2	2	2	2	2
CLO6	3	2	3		2	3	1		2		1	1	2	3	2	2	1	1	2

3: High, 2: Medium, 1: Low