Course Code: ZOC 204 **Course Title: Ecology**
Number of Credits: 3
Effective from AY: 2020 -21

Prerequisite for the Course:	Basic knowledge on Taxonomy, Biodiversity, Environment and Ecology.	
Objectives:	This course will help the learner to understand the concept and components of ecology and its importance, population, community structures along with interactions. Overall the course develops an in depth understanding of the whole ecosysytem ecology and the various related concepts. Additionally, this course also deals with emerging field of molecular ecology, conservation genetics and the environmental aspects highlighting the changing environment and global effects.	
Content:	**Module 1** **Introduction to ecology**; **Environment:** Physical environment; biotic environment; biotic and abiotic interactions; **Habitat and Niche:** Concept of habitat and niche, niche width and overlap, fundamental and realized niche, resource partitioning, character displacement; **Environmental concepts** – laws and limiting factors, ecological models. Ecological structure: Review of six levels of ecological organization and their importance and characteristic features.	**6 hours**
	Population Ecology: **Review** of Characteristics of a population; population growth curves; population dynamics, regulation and growth limits, fertility rate and age structure, life history strategies (*r* and *K* selection); concept of metapopulation – demes and dispersal, interdemic extinctions.	**3 hours**
	Community Ecology: **Review** of nature of communities ,community structure and attributes, levels of species diversity and its measurement; edges, ecotones and related concepts.	**3 hours**
	Module 2 **Ecological energetics:** Primary productivity, Gross productivity, Net Productivity. Net ecosystem production and various levels of respiratory losses (Autotrophs, Heterotrophs and decomposer levels), Biomass, Standing crop and Turnover, The Residence Time of Energy, Limiting factors of primary production (Light and Nutrients), Eutrophication, Secondary production, Production efficiency, Earth's Heat budget.	**5 hours**

	Species Interactions <u>Review</u> of Types of interactions, intra-specific and inter-specific interactions, Mutualism, Commensalism, Competition, prey-predator interactions, herbivory, carnivory, pollination, symbiosis.	**2 hours**
	Trophic ecology: Food web (Node, link, basal species, Top predators), Global comparisons of Marine food chains (Coastal regions, Open ocean and High upwelling areas), Types of food webs: connectedness webs, Energy flow webs and Functional webs; Topological webs, Flow webs and Interaction webs, Trophic cascades (Bottom-up and Top-down trophic level controls). Bioaccumulation and Bio-magnification.	**5 hours**
	Module 3 **Ecological Succession: <u>Review</u>** of Trajectory of Succession. Mechanisms/models of ecological succession (Facilitation, Inhibition, Tolerance), Alternative stable states and its model (stability, change & Hysteresis), Regime shifts and its models, Stability and sustainability (inertia/persistence, Constancy, Resilience)	**4 hours**
	Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.	**2 hours**
	Restoration ecology: Ecosystem degradation and restoration model, restoration approaches (Reclamation, Revegetation, Re-creation and Ecological engineering), Structural and Functional restoration type, Active and Passive restoration types, Biomanipulation, Bioremediation and Biological augmentation strategies, restoration in India (Nirmal Ganga Action Plan).	**4 hours**
	Molecular ecology: Genetic analysis of single and multiple population, phylogeography, molecular approach to behavioural ecology, conservation genetics.	**2 hours**
Pedagogy:	Lectures/tutorials/online teaching mode /self-study.	
Learning Outcome:	1. Essential in depth understanding of the concepts and components of ecology. 2. Learner will learn ecosystem structure and function along with the interactions involved at various levels.	

	3. Vision to understand the ecosystem ecology along with sufficient knowledge of energy flow and exchange. 4. Information about molecular ecology and conservation genetics. 5. Sensitization towards the environment with respect to the global scenario and the related problems, impact, along with methods to tackle the problems.
References /Reading:	1. Andel JV and Aronson J (2012), Restoration Ecology: The New Frontier, Second edition, Blackwell Publishing Ltd. 2. Baker AJ (2000), Molecular Ecology, In Molecular Methods in Ecology (ed. AJ Baker), Blackwell Publishing. 3. Chapman JL and Reiss MJ (1999), Ecology: Principles and Applications, Cambridge University Press. 4. Conklin AR (2004), Field Sampling: Principles and Practices in Environmental Analysis, CRC Press. 5. Fahey TJ and Knapp AK (2007), Principles and Standards for Measuring Primary Production, Oxford University Press, UK. 6. Grant WE and Swannack TM (2008), Ecological Modeling, Blackwell. 7. Odum EP and Barrett GW (2004), Basic Ecology: Fundamentals of Ecology, Fifth Edition, Oxford and IBH Publishing Co. Pvt. 8. Perrow MR and Davy AJ (2002), Handbook of Ecological Restoration Vol 2 Restoration in Practice, Cambridge University Press. 9. Sutherland WJ (2006), Ecological Census techniques a handbook, Cambridge University Press. 10. Wilkinson DM (2007), Fundamental Processes in Ecology: An Earth system Approach, Oxford University Press, UK.