

Unit IV: Nucleus (4 Hours)

Structure of Nucleus, Nuclear envelope, nuclear pore complex, Transport of molecules across nuclear membrane, nucleosome, nucleolus; Chromatin: euchromatin, heterochromatin.

Unit V: Cell Division (4 Hours)

Mitosis, Meiosis, Cell cycle and its regulation.

Unit VI: Introduction to Cell Signaling (05 Hours)

Cell Signaling through G-protein coupled receptor (GPCR) and role of secondary messenger: cAMP and protein kinase A.

Practical component (60 Hours)

1. Microscopy: Compound microscope: principle, components and handling; Phase contrast microscope; Electron microscope; Differential Interference Contrast (DIC) Microscope.
2. Principle and types of cell fixation and staining; Cell fractionation.
3. To study prokaryotic cells by Gram staining and eukaryotic cell (cheek cells) by hematoxylin/methylene blue.
4. To study the effect of hypotonic, isotonic, and hypertonic solutions on cell permeability.
5. Preparation of a temporary slide of squashed and stained onion root tip to study various stages of mitosis.
6. Study the effect of colchicine on mitosis at 24 hrs and 48 hrs.
7. Study of various stages of meiosis through permanent slides.
8. Preparation of stained mount to show the presence of Barr body in human female blood cells/cheek cells.
9. Cytochemical demonstration of:
 - a. DNA by Feulgen reaction
 - b. Mucopolysaccharides by PAS reaction
 - c. Proteins by Mercuric Bromophenol Blue/Acid Fast Green

Essential readings

1. Cooper, G.M., Hausman, R.E. (2019) The Cell: A Molecular Approach. VIII Edition, ASM Press and Sinauer Associates.
2. Becker, Kleinsmith, and Hardin (2018) The World of the Cell, IX Edition, Benjamin Cummings Publishing, San Francisco.
3. Karp, G. (2015). Cell and Molecular Biology: Concepts and Experiments, VIII Edition, John Wiley & Sons Inc.
4. Renu Gupta, Seema Makhija and Ravi Toteja (2018). Cell Biology Practical Manual, Prestige Publishers, New Delhi
5. VK Sharma (1991). Techniques in Microscopy and Cell Biology, Tata McGraw-Hill Publishing Company Limited, New Delhi

DISCIPLINE SPECIFIC CORE COURSE– 3 (DSC-3) Concepts of Ecology**Credit distribution, Eligibility and Pre-requisites of the Course**

Course	Credits	Credit distribution of the course	Eligibility	Pre-requisite
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title & Code		Lecture	Tutorial	Practical/ Practice	criteria	of the course(if any)
Concept o f Ecology	4	2	0	2	Class X II pass w ith Biology as one o f t he papers i n Class XII	NIL

Learning Objectives

The primary aim of this course is to develop a scientific understanding of the diverse aspects of the field of ecology. The students will be familiarized with the interactions between the organisms and their physical environment. Additionally, various attributes of populations and communities with help of theoretical concepts and field examples will be discussed. It provides a platform to understand the varied forces that lead to variations among populations of a species.

Learning outcomes

Upon completion of the course, the students should be able to:

- Demonstrate an understanding of the basic concepts of the subject
- Explain the characteristics, dynamics, and growth of populations
- Understand the characteristics of the community, ecosystem development and climax theories
- Gain knowledge about the relationship of the evolution of various species and the environment they live in.
- Design basic field studies, collect data and interpret it
- Carry out population and community studies

SYLLABUS OF DSC-3

Unit I: Introduction to Ecology (03 Hours)

Autecology and Synecology, Laws of limiting factors, Study of physical factors: Temperature and Light.

Unit II: Population (07 Hours)

Unitary and Modular populations; Unique and group attributes of population: density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion; Exponential and logistic growth, equations and patterns, r and k strategies; Intraspecific population regulation: density-dependent and independent factors.

Unit III: Species Interactions (06 Hours)

Types of species interactions, Interspecific competition: Lotka-Volterra model of competition, Gause's Principle with laboratory and field examples, Niche concept; Predation: Lotka-Volterra equations, Functional and numerical responses, predator defence mechanisms, Resource partitioning.

Unit IV: Community (05 Hours)

Community characteristics: species richness, dominance, diversity, abundance, guilds, ecotone and edge effect; Ecological succession with examples and types.

Unit V: Ecosystem (6 Hours)

Types of Ecosystems: Terrestrial ecosystem, vertical stratification in tropical forest; Food chain: detritus and grazing food chains, linear and Y-shaped food chains, food web; Energy flow through the ecosystem; Ecological pyramids and Ecological efficiencies; Biogeochemical cycle- nitrogen cycle.

Unit VI: Applied Ecology (03 Hours)

Ecology in wildlife conservation and management, Protected areas: National Parks, Biosphere reserves and Sanctuaries; Restoration ecology, Principles of Environmental impact assessment.

Practical components (60 Hours)

1. Study of life tables and plotting of survivorship curves of different types from hypothetical/ real data
2. Determination of population density in a natural or a hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index.
3. Study of an aquatic ecosystem:
 - a) Phytoplankton and zooplankton
 - b) Measurement of temperature, turbidity/penetration of light, determination of pH
 - c) Dissolved oxygen content (Winkler's method), chemical oxygen demand
 - d) Free carbon dioxide and alkalinity
4. Study of ten endemic animals of India with slides/pictures/videos.
5. Report on a visit to a National Park/Biodiversity Park/Wildlife Sanctuary.

Essential readings

1. Odum, E.P. and Barrett G. W. (2008). Fundamentals of Ecology. Indian Edition (5th). Publisher: Brooks/Cole.
2. Smith T. M. and Smith R. L. (2015). Elements of Ecology. 9th International Edition. Publisher: Benjamin Cummings.
3. Saha G.K. and Mazumdar S. (2020) Wildlife Biology, An Indian Perspective. Publisher: PHI Learning Private Limited
4. Zimmer C. and Emlen D. J., (2013) 1st Edition. Evolution: Making Sense of Life, Roberts & Co.
5. Futuyma, Douglas and Mark, Kirkpatrick (2017) 3rd Edition. Evolutionary Biology, Oxford University Press

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time