



जे. सी. बोस विज्ञान एवं प्रौद्योगिकी विश्वविद्यालय, वाए.एम.सी.ए, फरीदाबाद
J.C. BOSE UNIVERSITY OF SCIENCE & TECHNOLOGY, YMCA
SECTOR -6, MATHURA ROAD, FARIDABAD, HARYANA-121006
(Established vide Haryana State Legislative Act No. 21 of 2009)
'A+' GRADE NAAC Accredited
DEPARTMENT OF ENVIRONMENTAL SCIENCES

Lesson Plan

Faculty Name: Dr. Renuka Gupta
Department: Environmental Sciences
Subject: Ecology and Biodiversity

Academic Year: 2025-2026
Semester/Year: MSc EVS 1st Sem
Subject Code: ESP 101V

Topic No.	Topics to be Covered	Teaching Aids	No. of Lectures / Hours Required	Text / Ref. Books/Web resources	CO Mapping
UNIT-I: INTRODUCTION TO ECOLOGY					
1	Introduction-ecology	BB	1	R1, R2, R4 & R9	CO1 & CO2
2	Definition, subdivisions and scope	BB	1	R1, R2, R8 & R9	CO1
3	Basic concepts of ecology, Autecology and Synecology	BB	1	R5 & R9	CO1
4	Biological levels of organization-genes to biosphere	BB & PPT	1	R1 & R9	CO1
5	Interaction of ecological factors - Light, temperature, precipitation, humidity	BB & PPT	1	R1 & R3	CO1
6	Atmospheric gases, wind and fire, topographic and edaphic factors, adaptation	BB	1	R1, R11 & R12	CO1
7	Ecological concepts of species (Liebig's law of minimum, Shelford's law of Tolerance, Combined concept of limiting Factors)	BB	2	R1 & R3	CO1
UNIT-II: POPULATION AND COMMUNITY ECOLOGY					
8	Population characteristics	BB	1	R2 & R3	CO3
9	Population interaction	BB & PPT	1	R2 & R3	CO3
10	Prey-predator relations, competition, exploitation, mutualism, parasitism, allelopathy	BB & PPT	2	R2 & R3	CO3
11	Population growth and regulation	BB & PPT	2	R2, R3 & R5	CO3
12	Community structure and organization	BB & PPT	1	R2, R3 & R5	CO3
13	Concept of metapopulation, demes and dispersal	BB & PPT	1	R5	CO3
14	Habitat, niche-concept and types	BB & PPT	1	R2 & R5	CO3
15	Keystone species, flagship species and umbrella species, dominant species	BB	1	R9 & W4	CO3

16	Ecotone, edge effect, ecotypes, plant indicators	BB & PPT	1	R3 & R9	CO3
17	Ecological succession - types and mechanism.	BB & PPT	2	R3 & R9	CO3
UNIT-III: ECOSYSTEM DYNAMICS					
18	Introduction, kinds of ecosystem	BB	1	R7 & R9	CO2
19	Structure and function of ecosystem	BB	1	R7 & R9	CO2
20	Food chain, food web, trophic level	BB & PPT	1	R7 & R9	CO2
21	Ecological pyramids	BB & PPT	2	R5, R7 & R9	CO2
22	Energy flow models	BB & PPT	2	R5, R7 & R9	CO2
23	Ecosystem productivity, methods of measuring primary productivity	BB & PPT	1	R5, R7 & R9	CO2
24	Ecosystem stability and regulation	BB & PPT	1	R4 & R8	CO2
25	Biogeochemical cycles- cycling of water and nutrients	BB & PPT	2	R4 & R8	CO2
26	Structure of some typical ecosystems - forest, desert, grassland, pond, marine, wetland, estuaries, cropland	BB & PPT	2	R4 & R8	CO2
UNIT-IV: BIODIVERSITY					
27	Definition, levels of biodiversity	BB & PPT	1	R5 & R6	CO4
28	Measuring biodiversity, values of biodiversity	BB & PPT	2	R5 & R6	CO4
29	Hotspots of biodiversity, Biodiversity hotspots of India	BB & PPT	2	R5 & R6	CO4
30	Threats to biodiversity	BB	1	R5, R6 & R14	CO4
31	Biological Invasion: concept pathways, process, mechanism, impacts, examples of major invasive species in India	BB & PPT	2	R7	CO4
32	Endangered and threatened species, IUCN Categories of threatened species	BB & PPT	1	R5, R6 & R14	CO4
33	Red data book, List of threatened flora and fauna in India	BB & PPT	1	W2	CO4
34	Biodiversity conservation; National and international efforts for wildlife and forest conservation	BB & PPT	2	R5 & R6	CO4
35	Wetland conservation	BB & PPT	2	R5, R6 & R14	CO4
36	Convention on Biodiversity	BB	2	W1, W2, W3 & W4	CO4
Total Hours/Lectures			50		

Prepared by: Dr. Renuka Gupta
Assoc. Prof. in EVS

SYLLABUS ECOLOGY AND BIODIVERSITY

Course Code: ESP 101V/ EVS 101B
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Theory: 75
Sessional: 25
Total: 100
Duration of Exam : 3 Hrs.

COURSE OUTCOMES:

At the completion of this course, the learner will be able to:

CO1: Demonstrate knowledge of ecological principles operating at different levels of organization.

CO2: Understand the concepts of ecosystems and compare them with real life processes.

CO3: Analyze components of population and community ecology.

CO4: Interpret ecological and social phenomena from a biodiversity viewpoint and develop new conservation measures on new or endangered species in a given habitat.

UNIT-I: INTRODUCTION TO ECOLOGY

Definition, subdivisions and scope, basic concepts of ecology, Autecology and Synecology, biological levels of organization-genes to biosphere, Interaction of ecological factors - Light, temperature, precipitation, humidity. Atmospheric gases, wind and fire, topographic and edaphic factors, adaptation, Ecological concepts of species (Liebig's law of minimum, Shelford's law of Tolerance, Combined concept of limiting Factors).

UNIT-II: POPULATION AND COMMUNITY ECOLOGY

Population characteristics, population interaction, prey-predator relations, competition, exploitation, mutualism, parasitism, allelopathy, Population growth and regulation. Community structure and organization, Concept of metapopulation, demes and dispersal, Habitat, niche-concept and types, keystone species, Flagship species and umbrella species; dominant species, ecotone, edge effect, ecotypes, plant indicators, ecological succession - types and mechanism.

UNIT-III: ECOSYSTEM DYNAMICS

Introduction, kinds of ecosystem, structure and function of ecosystem, food chain, food web, trophic level, ecological pyramids, energy flow models, ecosystem productivity, methods of measuring primary productivity, Ecosystem stability and regulation, biogeochemical cycles-cycling of water and nutrients, Structure of some typical ecosystems - forest, desert, grassland, pond, marine, wetland, estuaries, cropland.

UNIT-IV: BIODIVERSITY

Definition, levels of biodiversity, measuring biodiversity, values of biodiversity, Hotspots of biodiversity, Biodiversity hotspots of India, threats to biodiversity. Biological Invasion: concept; pathways, process, mechanism, impacts, examples of major invasive species in India. Endangered and threatened species, IUCN Categories of threatened species, Red data book, List of threatened flora and fauna in India. Biodiversity conservation; National and international efforts for wildlife and forest conservation, wetland conservation, Convention on Biodiversity.

REFERENCE BOOKS:

1. Brewer, R. *The Science of Ecology*, Sanders College Publishing Co., Tokyo, 1994.
2. Odum, E.P. *Basic Ecology*, W.B. Saunders, Philadelphia, 1983.
3. Fatik B. Mandal and Nepal C. Nandi. *Biodiversity: Concepts, Conservation and Biofuture*, Asian Books, 2013.

4. Jorgensen, Sven Erik. *Encyclopedia of Ecology*. Vol 1-5. Elsevier Publishers. Netherlands, 2008.
5. Joshi, B.D., Tripathi, C.P.M and Joshi, P.C. *Biodiversity and Environmental Management*. APH, New Delhi, 2009.
6. Joshi, P.C. and Joshi, N. *Biodiversity and conservation*. APH Publishing Co-operation, New Delhi, 2009.
7. Kohli, R. K., Jose, S., Singh, H. P. and Batish, D. R. *Invasive Plants and Forest Ecosystems*. CRC Press / Taylor and Francis, 2009.
8. Odum, E.P., Barrick, M. and Barrett, G.W. *Fundamentals of Ecology* (5th Ed). Thomson Brooks/Cole Publisher, California, 2005.
9. Rana, S.V.S. *Essentials of Ecology and Environmental Science* (5th Ed), PHI Learning Pvt. Ltd, 2013.
10. Sharma, P.D. *Ecology and Environment*. Rastogi Publications. New Delhi, 2016.
11. Smith, R.L. (1996), *Ecology and Field Biology*, Harper Collins, New York.
12. Smith, T.M and Smith, R.L. *Elements of Ecology* (8th Ed), Benjamin Cummings, 2012.
13. Vandermeer, John H., Riddle, B.R. and Brown, J.H. *Population Ecology: First principle* (2nd Ed). Princeton University Press, 2013.
14. Singh, J.S., Singh, S.P. and Gupta, S.R. (2015). *Ecology, Environment and Resource Conservation*, S. Chand Publishing, New Delhi.

SUGGESTED WEB SOURCES:

1. http://envis.nic.in/ENVIS_html/ENVISSubject/subject.html
2. <https://www.iucn.org/>
3. <https://www.cbd.int/>
4. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=14>