DEPARTMENT OF BOTANY				*CLASS: I M.Sc. Botany*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
II	Major Core 6	21P2BMC6	Ecology and Conservation Biology	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

The course will enable the students to

1. acquire knowledge of various ecological aspects and communities,
2. associate and analyze the values and dynamics of various ecosystems,
3. detect the energy sources and the natural and man-made damage caused to the environment
4. integrate the biodiversity, hotspots, remote sensing and environmental laws and
5. identify and evolve suitable conservation strategies for value specific species and ecosystem.

UNIT	CONTENT	CLO	K LEVEL	HOURS
I	Aim and scope of Ecology – Autecology - Population ecology - Characteristics of population. Positive and negative interactions of species – Synecology – Qualitative and Quantitative characters of community. Niche–definition and types. Methods of studying plant community. Contemporary Ecological Issues: Pollination Crises and Urban Ecology.	**1**	**Up to K4**	**15**
II	Concept and dynamics of ecosystem: Types of Ecosystem, Components, Food chain, Food web and Energy Flow – Trophic level, Ecological Pyramids. Biogeochemical cycles – Hydrological, Carbon, Nitrogen, and Phosphorous cycles. Characteristic features, structure and functions of Forest, Grassland, Pond, Estuary and Manmade (Crop land) ecosystems. Ecological amplitude of a species and adaptation – *r & k* selection, Ecads, Ecotypes, Ecospecies, Raunkaier's Life Forms.	**2**	**Up to K4**	**15**
III	Utilization of energy resources – Non-renewable and renewable. Environmental pollution – Air, water, soil, thermal and radiation. Causes, consequences and control of pollution on global environment, Ozone depletion, Greenhouse effect, Climate change and Global warming. Ecological indicators. Biomagnifications and Eutrophication. Disaster management – Floods, Earth quake, Cyclone, Tsunami and Landslides. Man-animal conflict, Habitat Fragmentation and Animal Corridors.	**3**	**Up to K4**	**15**

IV	Biodiversity – levels – threats–hotspots. Endemism– Red Data Book – IUCN categories, continuous and discontinuous distribution of vegetation. Phytogeography: Phytogeographical regions of world – types of vegetation in India. Range – Dispersal and Migration Barriers hypothesis, Continental Drift hypothesis, Land-Bridges hypothesis, Age and Area hypothesis. Introduction to Remote Sensing and GIS. Earth Summit –Kyoto Protocol. Environmental Laws.	**4**	**Up to K4**	**15**
V	Conservation Biology: Introduction–current practices in conservation – ecosystem approaches – species-based – *In-situ* conservation: biosphere reserves, national parks, sanctuaries and *Ex-situ* conservation: afforestation, sthalavrikshas, sacred groves, social forestry, agro forestry, botanical gardens, cryopreservation, gene banks, seed banks, pollen banks, DNA banks, tissue culture and biotechnological strategies. Social movements for conservation - Chipko movement and Narmada BachoAndolan.	**5**	**Up to K4**	**15**

Books for study:

1. Odum, E. P. 1971. Fundamentals of Ecology. W. B. Saunders & Co., PhiladelphiaUSA.
2. Odum, E. P. 1975. Ecology. 2nd ed. Oxford & IBH Publications, New Delhi.
3. Vashista, P. C. 1974. A Textbook of Plant Ecology. Vishal Publications, Jullunder.
4. Krishnan Kannan 1997. Fundamentals of Environmental Pollution. S. Chand and Co. Ltd., New Delhi.
5. Kershaw, K. A. 1973. Quantitative and Dynamic Plant Ecology. Edward Arnold Publishers Ltd., London.
6. Odum, E.P. 1996. Fundamentals of Ecology. Nataraj Publishers. Dehradun.

Books for Reference:

1. Gillson, L. 2015. Biodiversity Conservation and Environmental Change, Oxford University Press, Oxford.
2. Krishnamoorthy, K.V. 2009. An advanced Text book on Biodiversity –Principles and practice, Oxford & IBH Publishing co, PVT. Ltd., New Delhi.
3. Kumar, H.D. 1999. Biodiversity and sustainable conservation. Oxford and IBM publishing Company, NewDelhi.
4. Melchias, G.2001, Biodiversity and Conservation, Oxford and IBM publishing company Pvt., Ltd. New Delhi.
5. Schulze,E., Beck,E., and Muller-Hohenstein, 2005. Plant Ecology, Springer, Berlin-Heidelberg.
6. Heywood, V. H. 1995 Global Biodiversity Assessment. UNEP, Cambridge University Press, London.

Web Resources:

1. https://www.c2es.org/
2. https://www.iucnredlist.org/
3. https://www.unep.org/
4. https://www.epa.gov/
5. https://ndma.gov.in/

Rationale of the Course:

The course focuses on how to protect and restore the environment or the diversity of life on Earth. The course will provide answers to specific questions that can be applied to management decisions with regard to conservation.

Activities having direct bearing on Skill development/Employability/ Entrepreneurship

The knowledge acquired by the students will enable them to get entry level jobs as junior consultant in environmental consulting, volunteer coordinator in non-profit organizations and research or teaching assistants in institutions.

Pedagogy:
Chalk and Talk, PPT, Group Discussion, Seminar, Interaction, Problem Solving, Quiz, Virtual Labs & Learning Management System (CANVAS).

Course Learning Outcomes:

CLOs	CLO Statement	Knowledge Level
	Students will be able to know, understand, apply and analyze	
CLO-1	The autecology and population ecology; various interactions and ecological issues	**Up to K4**
CLO-2	The types and dynamics of ecosystem; biogeochemical cycles and ecological amplitude of a species	**Up to K4**
CLO-3	The renewable and non-renewable energy sources; pollution and its impact; and disaster management	**Up to K4**
CLO-4	The levels and threats of biodiversity; phytogeography of world and India; hypothesis and tools of phytogeography	**Up to K4**
CLO-5	The In situ and ex situ conservation methods and social movements for conservation	**Up to K4**

3 – Advance application 2 – Intermediate level 1 – Basic level

Mapping Programme Specific Outcomes with Course Learning Outcomes:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	3	3	3	3
CLO-2	1	2	2	2	2
CLO-3	2	2	2	2	2
CLO-4	1	1	2	2	3
CLO-5	3	2	3	2	2

3 – Advance application 2 – Intermediate level 1 – Basic level

Lesson Plan

Unit	Description	Hours	Mode
I	a) Introduction - Ecology - Autecology b) Population ecology - Characteristics of population. c) Positive and negative interactions of species – Synecology d) Qualitative and Quantitative characters of community. e) Niche - definition and types. Methods of studying plant community. f) Contemporary Ecological Issues: g) Pollination Crises and Urban Ecology.	2 2 2 2 2 3 2	Chalk and talk PPT, LMS and Group discussion
II	a) Concept and dynamics of ecosystem: b) Types of ecosystem, components, Food chain, Food web and Energy Flow – Trophic level, Ecological Pyramids. c) Energy flow in the ecosystems. d) Biogeochemical cycles – Hydrological, Carbon, Nitrogen, and Phosphorous cycles. e) Characteristic features, structure and functions of Forest, Grassland, Pond, Estuary and Manmade (Crop land) ecosystems. f) Ecological amplitude of a species and adaptation – *r* & *k* selection, Ecads, Ecotypes, Ecospecies, Raunkaier's Life Forms.	1 3 1 3 4 3	Chalk and talk PPT, LMS and Group discussion
III	a) Utilization of energy resources – Non-renewable and renewable. b) Environmental pollution – Air, water, soil, thermal and radiation. Causes, consequences and control of pollution on global environment c) Ozone depletion, Greenhouse effect, Climate change and Global warming. d) Ecological indicators. Biomagnifications and Eutrophication. e) Disaster management – Floods, Earth quake, Cyclone, Tsunami and Landslides. f) Man-animal conflict, Habitat Fragmentation and animal Corridors.	2 3 2 3 2 3	Chalk and talk PPT, LMS and Group discussion

IV	a) Biodiversity levels, threats, hotspots. b) Endemism– red data book – IUCN categories, continuous and discontinuous distribution of vegetation. c) Phytogeographical regions of world – types of vegetation in India. d) Range – Dispersal and Migration Barriers hypothesis. e) Continental Drift hypothesis, Land- Bridges hypothesis, Age and Area hypothesis f) Introduction to Remote Sensing and GIS g) Earth Summit- Kyoto Protocol h) Environmental Laws.	2 2 1 1 3 3 2 1	Chalk and talk PPT, LMS and Group discussion
V	a) Conservation Biology: Introduction, current practices in conservation, ecosystem approaches, species-based approaches b) *In situ* conservation: biosphere reserves, national parks, sanctuaries. c) *Ex-situ*conservation: afforestation,sthalavrikshas, sacred groves. d) Social forestry, agro forestry, botanical gardens, cryopreservation. e) Gene banks, seed banks, pollen banks, DNA banks. f) Tissue culture and biotechnological strategies. g) Social movements for conservation- chipko movement and Narmada BachoAndolan	3 2 2 2 2 2 2	Chalk and talk PPT, LMS and Group discussion
Total		**75**	

Pedagogy:
Chalk and Talk, PPT, Group Discussions, Seminars, Interactions, Quizzes, Virtual Labs, Google classroom and Learning Management System (CANVAS).

Course designer: **Dr. S. Gnaana Saraswathi,** Assistant Professor**.**

PG Botany BluePrint

Test	10 marks	As per table below
Assignment	5 marks	K4
Seminar	5 marks	K4
Quiz	5 marks	K4

Learning Outcome Based Education (LOBE) & Assessment
Formative – Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
1	CLO x	Up to K3	2	K2,K3	2 (K3&K3)	2 (K2,K3)
2	CLO y	Up to K4	3	K2, K2, K3	2 (K4&K4)	1 (K3/K4)
No. of Questions to be asked			5		4	3
No. of Questions to be answered			5		2	2
Marks for each question			2		5	10
Total Marks for each section			10		10	20

Learning Outcome Based Education (LOBE) & Assessment
Summative Examination – Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K2	2	K1 & K1	1	K1	2 (K1&K1)	1 (K2)
2	CLO 2	Up to K3	2	K2 & K3	1	K1	2 (K2&K2)	1 (K3)
3	CLO 3	Up to K4	2	K2 & K3	1	K2	2 (K3&K3)	1 (K3)
4	CLO 4	Up to K4	2	K3 & K4	1	K2	2 (K4&K4)	1 (K4)
5	CLO 5	Up to K4	2	K3 & K4	1	K3	2 (K4&K4)	1 (K4)
No. of Questions to be asked			10			5	10	5
No. of Questions to be answered			10			5	5	3
Marks for each question			1			2	5	10
Total Marks for each section			10			10	25	30

Distribution of Section- wise marks with K Levels in the summative examinations

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	**16**	13.33	**35%**
K2	2	4	10	10	**26**	21.66	
K3	4	2	10	20	**36**	30.00	**30%**
K4	2	-	20	20	**42**	35.00	**35%**
Total Marks	10	10	50	50	**120**	100.00	**100%**