University of Kerala

Discipline	**ZOOLOGY**				
Course Code	**UK5DSEZOO301**				
Course Title	**Ecology and Disaster Management**				
Type of Course	**DSE**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	Pass in Class XII				
Course summary	The course provides a basic understanding of the various concepts in ecology such as biotic and abiotic components of ecosystems, characteristics of population, community, and ecological succession. The course also provides basic understanding of disaster management such as classification of disasters, causes and impact of disasters, disaster management strategies, policies and agencies etc. The course also provides selected case studies and the role of Information Technology in disaster management.				

Detailed Syllabus: Ecology and Disaster Management
Credit- 3 (Total 45 hrs)

Module	Unit	Content	45 Hrs
I		**Introduction to Ecology**	**6**
	1.1	**Structure of ecosystem- Abiotic factors** (brief account only) - light, temperature, soil, water, air: **Biotic factors** (brief account only) - autotrophs, phagotrophs and saprotrophs inter-relationship between biotic and abiotic factors.	4
	1.2	**Primary production**- Definition and types (Gross Primary Production and Net Primary Production)	1
	1,3	Pond as a typical ecosystem (Trophic relationships, producers, consumers and decomposers).	1
II		**Population and Community Ecology**	**14**
	2.1	**Characteristics of a population** - density, natality, mortality, age distribution, biotic potential, environmental resistance and carrying capacity, population growth forms- J and S shaped curves, emigration, immigration and migration, population fluctuation. Mention Ecotype and metapopulation.	6
	2.2	**Characteristics of a Community**: stratification, species diversity, species abundance, species dominance, community periodicity. Brief accounts on niche, trophic level and guild.	5
	2.3	**Ecological succession**: Definition, Types and different stages. Eg. Succession in an aquatic ecosystem.	3

III		**Disaster management**	**9**
	3.1	**Disaster:** Definition. Classification of disasters- Natural Hazards- Brief account on Cyclone, Tsunami, Heat Wave, Landslide, Urban Floods, Floods and Earthquakes. Man-made hazards - brief account on Chemical, nuclear and biological.	4
	3.2	**Cause and impact of disasters**- Natural and anthropogenic causes. Mention environmental impact only.	2
	3.3	**Disaster management**: Prevention, mitigation strategies, preparedness. A brief account of Psychological first aid.	3
IV		**Disaster management Strategies**	**8**
	4.1	**Policies and agencies**: National Disaster Management Plan, 2019**,** Kerala State Disaster Management Plan, 2016. Kerala State Disaster Management Authority (KSDMA) and National Disaster Management Authority (NDMA).	5
	4.2	**Need of Disaster management strategies**: A case study on Kerala flood 2018 and Uttarakhand Cloudburst; Role of Information Technology in Disasters	3
V		**Ecosystem control and management**	**8**
	5.1	**Control and management:** Brief account on bioremediation, sewage treatment, green chemistry	3
	5.2	**Air pollution mapping software** – Brief description on AirNow, IQ Air and AirVisual).	2
	5.3	**Sustainable development and ecosystem approach**- Environment Impact Assessment, green audit.	3

REFERENCES:

1. Abbott Leon (2008). Natural Disaster, McGraw-Hill. ISBN-13: 978 0072 428650.
2. Agarwal, A. & Sen, S (1999). The Citizen & Fifth Report, Centre for Science and Environment. New Delhi.
3. Beck, W.S., Liem, K.F. & Simpson, G.G (1991). Life: An Introduction to Biology (3rd Ed.) Harper Collins Publishers, New York, pp 1361. ISBN: 006500009 9.
4. Bharucha, E. (2005). Textbook of Environmental Studies. Universities Press (P) Ltd. India, pp 276. ISBN 817371 540 8.
5. Chandna, R.C. (1998). Environmental Awareness, Kalyani Publishers, New Delhi.
6. Charry, S.N. (2008). Environmental Studies. MacMillan India Ltd. ISBN: 10:0230 635318, 13: 987 0230 6351 9.
7. Chapman, J.L., & Reiss, M.J. (1999). Ecology: Principles and Applications (2nd Ed.). Cambridge University Press, UK. ISBN: 0521 005752
8. Cunningham, W.P. & Cunningham, M.A. (2003). Principles of Environmental Science Inquiry and Applications. Tata McGraw Hill Publishing Company Ltd. New Delhi. ISBN 0 07 058112.
9. Colinvaux, P.A (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
10. Donald Van De Veer and Christine Pierce (2003). The Environmental Ethics & Policy Book (3rd Ed.). Wadsworth.
11. Emmel, T.C. (1976). Population Biology. Harper & Row Publishers, New York. ISBN 06 041904 0 Coppola.
12. Damon (2011). Introduction to International Disaster Management, Elsevier ISBN:

978-0- 12-3821744.
13. Krebs, C.J. (2001). Ecology: The experimental analysis of distribution and abundance. V Edition. Benjamin Cummings. San Francisco.
14. Odum E.P. (2017). Fundamentals of ecology. Indian edition. Brooks/Cole
15. Rajalekshmi, V. (2004). Environmental and sustainable development.APH Publishing Corporation, New Delhi. ISBN 81 7648 552 7.
16. Ricklefs, R.E and Miller, G.L (2000). Ecology. IV Edition. W.H Freeman, New York.
17. Robert Leo Smith (1966). Ecology and field biology Harper and Row publisher. New York and London.
18. Sharma, H.S. (2000). Ranthambore Sanctuary – Dilemma of Eco-development, Concept Publishing Company
19. Shrivastava, A.K (2023). Textbook of Disaster Management. Scientific Publishers, India.

Web Resource:

Disaster Management www.ifrc.org/en/what-we-do/disaster-management/

PRACTICUM

Credit – 1 (Total 30 Hours)

(Wherever wet lab experiments are not possible, the principles and concepts can be demonstrated through any other material or medium, including videos/virtual labs, etc.)

PRACTICUM*		
Sl. No	**Contents (Any two major practicals, two minor practicals, demonstration and spotter)**	
1	Estimation of dissolved oxygen of water sample	Major
2	Estimation of CO_2 in water	Major
3	Measurement of pH of different water samples using pH meter, pH paper and indicator solution.	Minor
4	Study of ecological adaptations	Spotter
5	Primary productivity using dark and light bottles	Demonstration, Spotter
6	Extraction of soil organisms – Berlese funnel	Demonstration, Spotter
7	Construction of food web	Minor
8	Study of marine planktons / Freshwater planktons	Minor
9	Turbidity using Secchi disc in polluted and unpolluted waters	Demonstration, Spotter
10	Estimation of hardness of water samples	Demonstration
11	Ecological indicators – Identification & submission of a report with photographs	
12	Field study & Report submission of any one ecologically important area – mangroves/rocky shore/pond/sacred groove/forest etc.	
13	Field visit and report submission of sewage treatment plant	
14	Field visit to sites of national importance having environmental issues related to pollution, natural disasters, ecosystem restoration etc. and report submission. (**Sl.No 12 ,13& 14 can be clubbed together for a maximum of 4 days study tour programme**).	

***Any 6 items from Sl.no.1 to 11 including 2 major and 2 minor practical**

REFERENCES:

1. Bharucha, E. (2005). Textbook of Environmental Studies. Universities Press (P)

Ltd. India, pp 276. ISBN 817371 540 8.
2. Chandna, R.C. (1998). Environmental Awareness, Kalyani Publishers, New Delhi.
3. Charry, S.N. (2008). Environmental Studies. MacMillan India Ltd. ISBN: 10:0230 63531
4. 8, 13: 987 0230 6351 9.
5. Chapman, J.L., & Reiss, M.J. (1999). Ecology: Principles and Applications (2nd Ed.) Cambridge University Press, UK. ISBN: 0521 005752
6. Cunningham, W.P. & Cunningham, M.A. (2003). Principles of Environmental Science Inquiry and Applications. Tata McGraw Hill Publishing Company Ltd. New Delhi. ISBN 0 07 058112.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Recall and explain the structure of ecosystems, including abiotic and biotic factors, primary production, and pond ecosystem dynamics, and analyse the interrelationship between living and non-living components in maintaining ecosystem balance.	R,U,Ap,An, E,C	1,2,3
CO2	Understand, apply, analyse, and evaluate the characteristics of populations and communities, ecological succession, and related ecological concepts using theoretical knowledge and field-based examples to interpret ecosystem dynamics and environmental interactions.	R,U,Ap,An, E,C	2,4,5
CO3	Remember and analyse the classification, causes, environmental impacts, and management of natural and man-made disasters, including prevention, mitigation, preparedness, and psychological first aid, to understand disaster risk reduction and sustainable environmental management.	R,U,Ap,An, E,C	2,6,7
CO4	Understand and analyse disaster management policies, agencies, mitigation strategies, major disaster case studies, and the role of information technology in disasters to enhance awareness, resilience, and sustainable disaster risk reduction.	R,U,Ap,An, E,C	1,3,6
CO5	Remember, explain, and illustrate pollution control and management methods, air pollution mapping software, sustainable development approaches, Environment Impact Assessment, and green audit to understand ecological importance and environmental analysis techniques.	R,U,Ap,An, E,C	1,4,5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Ecology and Disaster Management
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	Recall and explain the structure of ecosystems, including abiotic and biotic factors, primary production, and pond ecosystem dynamics, and analyse the interrelationship between living and non-living components in maintaining ecosystem balance.	PO-1/PSO-1,2,3	R,U,Ap, An,E,C	F, C, P	L	P
2	Understand, apply, analyse, and evaluate the characteristics of populations and communities, ecological succession, and related ecological concepts using theoretical knowledge and field-based examples to interpret ecosystem dynamics and environmental interactions.	PO-2/PSO-2,4,5	R,U,Ap, An,E,C	F, C,P	L	P
3	Remember and analyse the classification, causes, environmental impacts, and management of natural and man-made disasters, including prevention, mitigation, preparedness, and psychological first aid, to understand disaster risk reduction and sustainable environmental management.	PO-6/PSO-2,6,7	R,U,Ap, An,E,C	F, C,P	L	P
4	Understand and analyse disaster management policies, agencies, mitigation	PO-2,4,6/PSO-1,3,6	R,U,Ap, An,E,C	F, C,P	L	P

	strategies, major disaster case studies, and the role of information technology in disasters to enhance awareness, resilience, and sustainable disaster risk reduction.					
5	Remember, explain, and illustrate pollution control and management methods, air pollution mapping software, sustainable development approaches, Environment Impact Assessment, and green audit to understand ecological importance and environmental analysis techniques.	PO-1,5,7/ PSO-1,4,5	R,U,Ap, An,E,C	F, C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	3	2	-	-	-	-	3	-	-	-	-	-	-	-
CO 2	-	3	-	3	2	-	-	-	2	-	-	-	-	-	-
CO 3	-	2	-	-	-	3	2	-	-	-	-	-	3	-	-
CO 4	2	-	2		-	3	-	-	2	-	3	-	2	-	-
CO 5	3	-	-	3	2	-	-	2	-	-	-	3	-	3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low

2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Suggestive Assignments (Any two):

1. Solid and e-waste management
2. Biogeochemical cycles
3. Species interactions
4. Impact of climate change on ecosystems
5. Ramsar sites of Kerala
6. Application of microbes in pollution abatement

Continuous Comprehensive Assessment

- Assignments
- Seminar
- Field Report submission
- Test
- Quiz

End Semester Evaluation

- Multiple choice questions
- Very short answer questions
- Short answer questions
- Essay type questions
- Practical examination

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓		✓