



## SECOND SEMESTER 2022-23

### Course Handout Part II

Date: 10.01.2023

In addition to Part – I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

<b>Course No.</b>	<b>: BIO F241</b>
<b>Course Title</b>	<b>: ECOLOGY &amp; ENVIRONMENTAL SCIENCE</b>
<b>Instructor-in-charge</b>	<b>: P. SANKAR GANESH</b> ( <a href="https://universe.bits-pilani.ac.in/hyderabad/psankarganesh/Profile">https://universe.bits-pilani.ac.in/hyderabad/psankarganesh/Profile</a> )
<b>Instructor</b>	<b>: P. Sankar Ganesh, Supratim Ghosh</b>

#### 1. Scope of the course:

In the past few decades, man has achieved mental development that has translated into scientific and technological innovations to improve/manipulate life and environment. As a consequence, the science of ecology, dealing with organism-environment relationships, has become more and more an integrated discipline that links the natural and the social sciences. While ecology retains its strong and basic roots in biological sciences, it is a 'hard' science as it involves mathematics, chemistry and physics. It is a 'soft' science too as it involves a study of human behavior and activity. As an integrated science, ecology has a vast potential of application to human welfare, merging natural science with it's with social, economic and political counterparts. In short, ecology helps us understand our planet – Mother Earth – better and devise sustainable methods to preserve it.

#### 2. Objective of the course:

The objective of this course is to make the students aware of the various segments of our environment, interaction between abiotic and biotic components of ecosystems, energy and material utilization strategies, anthropogenic activities leading to ecosystem imbalance, depletion of natural resources and the impact of 'greedy' and polluting technological developments on the ecosystem. The course culminates by looking at the Indian scenario on the protection of local ecology and environment. Additionally, the course is very well aligned with the syllabus for Life Sciences (10. Ecological Principles) of CSIR-UGC National Eligibility Test (NET) for Junior Research Fellowship and Lectureship.

#### 3. Intended learning outcomes:

After successful completion of this course, students will be able to but not limited to:

- Define various segments of environment and limiting factors
- Demonstrate knowledge of principles and concepts of ecosystem
- Outline regional ecology and major ecosystem types
- Design effective experiments to calculate nutrient budgets
- Measure energy flow in ecosystems
- Explain influence of carrying capacity in population ecology
- Compare and contrast interactions among various species in a community
- Examine large scale patterns of ecosystem development
- Relate pollution ecology and environmental biotechnology and their impact on society

#### 4. Text book (TB):

Eugene P. Odum & Gary W. Barrett, *Fundamentals of Ecology*, 5<sup>th</sup> Ed, Cengage Learning, India Edition, 2005.

## 5. Reference Book (RB):

E J Kormondy, *Concepts of Ecology*, 4<sup>th</sup> Ed, Prentice Hall of India Pvt. Ltd., 1996.

## 6. Suggested Reading:

Thomas M. Smith & Robert Leo Smith, *Element of Ecology*, 6<sup>th</sup> Ed, Pearson Education, Inc., 2006

Madhab Chandra Dash & Satya Prakash Dash, *Fundamentals of Ecology*, 3<sup>rd</sup> Ed, Tata Mc Graw Hill Education Private Limited, New Delhi, 2009.

Richard T. Wright & Dorothy F. Boorse, *Environmental Science: Towards a Sustainable Future*, 11<sup>th</sup> Ed, Benjamin Cummins, 2011.

Daniel B. Botkin, & Edward A. Keller, *Environmental Science: Earth as a Living Planet*, 7<sup>th</sup> Ed, Wiley, India, 2010.

## 7. Selected Web resources:

<http://ecology.com>

<http://www.ecologyasia.com>

<http://pbil.univ-lyon1.fr/Ecology/Ecology-WWW.html>

<http://www.envirolink.org>

<http://ice.ucdavis.edu>

## 8. Course Plan:

<i>Lecture Number</i>	<i>Learning objectives</i>	<i>Topics to be covered</i>	<i>Reference chapter</i>
1	Introduction	Scope of ecology	TB Chap 1
2-3	Beginning the science of Ecology: Segments of environment	Soil, nutrients and other limiting & regulatory factors	TB Chap 5
4	Principles pertaining to limiting factors	Minimum and tolerances laws	TB Chap 5
5-6	Principles and concepts of ecosystem	Concept and structure	TB Chap 2
7		Ecosystem cybernetics & Technoecosystems	
8-9	Regional Ecology: Major ecosystem types	Marine ecosystems	TB Chap 10
10		Fresh water ecosystems	
11		Terrestrial ecosystems, desert ecology, human-designed and managed systems	
12	Nutrient budgets	Internal and external nutrient budget	TB Chap 5

<i>Lecture Number</i>	<i>Learning objectives</i>	<i>Topics to be covered</i>	<i>Reference chapter</i>
13-14	Principles and concepts of energy flow in ecosystems	Global production and decomposition	TB Chap 2
15		Solar radiation and the energy environment	RB Chap 6 TB Chap 3
16-17		Concept of productivity: Measuring primary productivity	RB Chap 6
18		Ecological pyramids and energy flow models	RB Chap 7
19		Energy partitioning in food chains and food webs	RB Chap 7
20	Population ecology: concept and attributes	Properties of population & carrying capacity	TB Chap 6
21		Density-independent and density-dependent mechanisms of population regulation	
22		Allee principle, home range & territoriality	
23		Metapopulation dynamics, energy partitioning and optimization: <i>r</i> - and <i>K</i> - selection	
24	Community Ecology: structure and function	Types of interactions among species	TB Chap 7
25		Cooperation and competition	
26		Positive and negative interactions	
27		Concepts of habitat, ecological niches, guilds and paleoecology	
28-29		Biodiversity	
30-31	Ecosystem development: Evolution	Ecosystem development & succession	TB Chap 8
32-34		Concept of climax, evolution of biosphere	
35-36	Pollution ecology	Anthropogenic impact on atmosphere, aquatic & terrestrial ecosystems, solid waste management	RB 2 Chap 8 & class notes
37-38	Introduction to environmental biotechnology	Basic concept of environment and its components. Biotechnology for environment; definitions and facts. A brief introduction to the topic with relevant examples.	Class notes
39	Ecology and society	Viewing Indian society from an ecological perspective.	Class notes

**Portions for self-study:**

- Insolation, precipitation and climate (RB1 Ch 4)
- Biogeochemical cycles (TB Ch 4)

**9. Evaluation scheme:**

<b><i>Evaluation component</i></b>	<b><i>Duration</i></b>	<b><i>%</i></b>	<b><i>Date and time</i></b>	<b><i>Nature of the Component*</i></b>
<b>Mid Semester Examination</b>	1.5 Hrs	30	14/03/2023 9.30 to 11.00 am	CB
<b>Surprise tests</b>	Diverse	10	Continuous Evaluation	CB
<b>Assignments/ Classwork<sup>§</sup></b>	Diverse	20	Continuous Evaluation	OB
<b>Comprehensive examination</b>	3 Hrs	40	10/05/2023 FN	CB

\*OB: Open book; CB: Closed book

§Classwork: Presentation/Group Discussion/Comprehension/Practical Sessions, etc.

**10. Chamber consultation hour:**

To be announced in the class.

**11. Grading policy:**

Award of grades will be guided in general by the histogram of marks. Decision on border line cases will be taken based on individual's sincerity, student's regularity in attending classes, and the section instructor's assessment of the student.

**12. Make-up policy:**

Make-up for Mid semester examination will be given only in genuine (medical emergency) cases of absence. If the absence is anticipated, before the examination, prior permission of the instructor-in-charge is necessary. Request for make-up should reach the instructor-in-charge at the earliest. Make-up for class tests/ quizzes and assignments are not given. Also refer to Clause 4.07 of BITS *Academic Regulations* for more details.

**13. Notices:**

All notices/ announcements regarding this course shall be displayed in Course Management System (CMS).

**14. Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Prof. P. Sankar Ganesh**  
**Instructor In-charge**  
**BIO F241**