

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: ECOLOGY AND ENVIRONMENTAL POLLUTION
(Code: - 3341302)

Diploma Programme in which this course is offered	Semester in which offered
Environment Engineering	4 th Semester.

1. RATIONALE

Ecology and Environmental Pollution is a core subject of Environmental Engineering. This subject intends to develop meaningful understanding of facts, concepts, principles and procedures and applications related to ecological system and environmental pollution in the minds of students so that they are able to relate to & discuss real world environmental pollution problems, prevention & control measures.

2. COMPETENCY :

The course content should be taught and curriculum should be implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Explain the interrelationship amongst the elements of ecology of natural systems, ecosystem, food chains, bio-geo chemical cycles, development and environmental pollution.**

3. COURSE OUTCOMES :

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Develop understanding about ecological relationships in terms of its' elements,& their interactions
- Comprehend the concept of matter, energy & energy flow in the earth's dynamic system of cycles.
- Explain principles of biology in relation to environmental problems.
- Discuss environmental pollution with respect to the sources, causes, effects, prevention & control measures relating to air, water, land and noise.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Introduction	1a. Explain the elements of ecology of natural systems, their interaction & relationship.	1.1 Concept of ‘ecology’ 1.2 Elements & subsystems of ecology and their relationship 1.3 Importance of environment and scope 1.4 Engineering and environment issues. 1.5 Roll of Government, NGO and Individual in Prevention of Environmental pollution
Unit – II Ecosystem	2a. Explain the concept of ecosystem. 2b. Describe the types of ecosystems. 2c. Identify factors that affect ecosystems 2d. Discuss energy relationship with in an ecosystem.	2.1 Components of Ecosystem. 2.1.1 A biotic substances. 2.1.2 Producer Organisms. 2.1.3 Consumer Organisms. 2.1.4 Decomposer Organisms 2.2 Natural ecosystem 2.3 Artificial ecosystem 2.4 Ideal Ecosystem 2.5 Energy relationship in an ecosystem 2.6 Factors affecting ecosystem 2.7 Impact of Human on Ecosystem
Unit – III Food Chains & Food Webs.	3a. Discuss types of Food Chain and types of Food Webs in an ecosystem.	3.1 Grazing food chain. 3.2 Detritus food chain.
Unit – IV Ecological Pyramids & Tropic Structures	4a. Describe types of Ecological Pyramids and Bio magnification. 4b. Identify natural resources for matter, energy & concept of energy flow.	4.1 Pyramids of numbers. 4.2 Pyramids of Biomass. 4.3 Pyramids of energy & Energy sources. 4.4 Energy flow through ecosystem 4.5 Tropic Level & Tropic Structure
Unit – V Bio-Geo- Chemical Cycles.	5a. Describe different types of Bio-Geo Chemical Cycles with major features & the effects of human activity	5.1 Hydrological cycle 5.2 Carbon cycle. 5.3 Oxygen cycle 5.4 Nitrogen cycle 5.5 Phosphorus cycle 5.6 Sulfur cycle rooms
Unit – VI Environmental Pollution	6a. Discuss the sources, causes & effects of: 6a.1 Water pollution. 6a.2 Marine Pollution 6a.3 Land Pollution 6a.4 Air Pollution 6a.5 Noise Pollution 6a.6 Radio-Active Pollution 6b. Explain measures of preventing & controlling pollution of: 6b.1 Water 6b.2 Land 6b.3 Air	6.1 Surface water & Ground water Resources & World water distribution. 6.2 Environmental problems of over use of water resources. 6.2.1 Eutrophication. 6.2.2 Thermal pollution – Causes, Effects and Control 6.3 Water pollution – Causes, Effects and control measures 6.4 Marine Pollution – Causes, Effects and Control Measures 6.5 Sources and Types of Soil pollution. 6.6 Impact of soil pollution on soil quality. 6.7 Effect of industrial pollutants on soil

Unit	Major Learning Outcomes	Topics and Sub-topics
		6.8 Air pollution , sources, types of pollutants causes& effects on human health, measures to prevent & control air pollution & effects 6.9 Noise & Sound, Parameters for measurement of Noise. 6.10 Sources of Noise Pollution. 6.11 Measurement of noise pollution 6.12 Effects and control of Noise Pollution 6.13 Radiation Fundamental and Measurement 6.14 Types of Radiation 6.15 Sources of Radio-active Pollution 6.16 Effects of Radio-active Pollution 6.17 Control of Nuclear(Radio Active) Pollution
Unit – VII Global Environmental Problems	7a. Discuss global environmental problems& their effects	7.1 Acid Rain. 7.2 Green House effect 7.3 Ozone Layer depletion. 7.4 Global warming 7.5 Global Climate Change- EL Nino and its effects, Causes of occurrence etc..

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction	2	00	05	00	05
II	Ecosystem	6	02	05	03	10
III	Food Chains And Food Webs	6	03	07	00	10
IV	Ecological Pyramids And Trophic Structures	7	03	04	03	10
V	Bio-Geo- Chemical Cycles	4	03	02	00	05
VI	Environmental Pollution	12	06	06	08	20
VII	Global Environmental Problems	5	04	06	00	10
Total		42	21	35	14	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's Revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED LIST OF EXERCISES/ASSIGNMENTS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

*Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise/Assignments	Approx. Hrs. Required
1	I	Assignment based on importance of ecology in Environmental Engg. Field	6
2	II	Assignment based on Ecosystem and Types of Ecosystem	6
3	III	Assignment based on Food chains & food webs.	6
4	IV	Assignment based on Ecological Pyramids & Trophic structures.	8
5	V	Assignment based on Biogeochemical cycles.	6
6	VI	Assignment based on Water resources & Water Pollution	4
7	VI	Assignment based on Marine Pollution	2
8	VI	Assignment based on Soil Pollution	2
9	VI	Assignment based on Noise Pollution.	4
10	VI	Assignment based on Radio Active Pollution	2
11	VII	Assignment based on Global Environmental Problems	6
Total Hours (Complete assignments worth 28 hours so that most units are covered)			52

8. SUGGESTED LIST OF STUDENT ACTIVITIES (Home Assignment)

- i. Make a report after gathering information the values of water, noise pollution and air pollution in your city/town and compare the values in other cities and towns in India with respect to environmentally acceptable levels
- ii. Prepare sketches for : Different types of Bio-Geo Chemical Cycles,

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

Show video films/animations/photographs etc related with issues of environment, causes of pollution and green technologies

10. SUGGESTED LEARNING RESOURCES

A. List of Books

S. No.	Title of Books	Author	Publication
1	Text Book of Ecology	P.D. Sharma	
2	Environmental Ecology	Kudeshia	
3	3. Ecology and Environmental Science	S.V.S. Rana	
4	Ecology and Environment	Majid Husain	
5	Ecology and Environment	B. N. Pandey and M. K. Jyoti.	
6	Ecology and Environment	H.B.Singh	
7	Ecology and Environment	P. R. Trivedi.	
8	Ecology and Environmental Biology	C. M. Chakarwarty.	
9	Ecology and Environmental Management	M.S.Sankar	
10	Introduction to Ecology,	Paul Colinvaux, 1973..	
11	Ecology and Human Well- Being : Nature and Society in Himachal Pradesh	Raghubir Singh Pirta	
12	Introduction to Ecology,	E.P. Odum, 1971..	
13	Environmental Science-Systems & Solutions	Michael L.Mckinney& Robert M.Schoch	J.B.Pub. Intl

B. List of equipment/instrument

Not Applicable

C. List of Software/Learning Websites

- i. www.gwssb.org
- ii. www.cpcb.nic.in
- iii. www.neeri.res.in
- iv. www.gpcb.gov.in

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. H. L. PUROHIT**, H.O.D. Civil Engineering, L.E. College, Morbi
- **Prof. M.C.SANANDIYA**, Lecturer in Environmental Engineering, Shri K.J.Polytechnic, Bharuch

Faculty Member/s from NITTTR Bhopal

- **Dr. V. H. Radhakrishnan**, Professor, Department of Civil & Environment Engineering
- **Prof. M.C. Paliwal**, Department of Civil & Environment Engineering