

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: ENVIRONMENTAL ENGINEERING & POLLUTION CONTROL
(COURSE Code: 3350608)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	5 th Semester

1. RATIONALE:

The understanding about environment is very essential for engineers as it guide for sustainable development. We all appreciate that the use of water, air and other resources must be available as required for human kind and polluted component must be disposed off in nature by giving proper treatment. So the natural flora and fauna will not get affected by sewage disposal.

In present time, solid waste, Noise, Air pollution, land pollution also wants more attention. This course focuses on students' acquisition of knowledge, skills & practices in environmental engineering and pollution control .Knowledge about Environment Impact Assessment, air-pollution control, noise-pollution control, solid waste management etc is imparted in this course. The technician must know about the quality of domestic water to be supplied to the society and treatment of waste water.

The knowledge and application of such aspects is essential in developing a good technician who should be conversant with environmental problems and their solutions.

2. LIST OF COMPETENCY

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

- Assess the problems of various kinds of pollution in the environment
- Prepare proper EIA report for impact of pollution due to industries on the environment.
- Take appropriate measures to control the pollution level for mankind.

3. COURSE OUTCOMES

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

- i. Appreciate components of Environment.
- ii. Elaborate Ecology and Ecosystem
- iii. Describe Acid Rain, Ozone layer depletion
- iv. Explain Green House effect
- v. Describe remedial measures to control noise pollution
- vi. Describe remedial measures to control air pollution
- vii. Measure pollutants – sampling, Physical characteristics , chemical characteristics , biological characteristics

- viii. Explain control measures to prevent land pollution
- ix. Evaluate the quality of environmental impact assessment

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
L	T	P		Theory Marks		Practical Mark		Total Marks
			ESE	PA	ESE	PA		
03	00	02	05	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. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub Topics
Unit-I Introduction to Environmental Engineering and Ecology	1a Explain importance of Environmental engineering 1b Appreciate components of Environment. 1c 2.a Elaborate Ecology and Ecosystem 1d Explain Ecological “Pyramid” concept of Numbers, biomass , Energy 1e Describe biogeochemical cycles Explain Biodiversity	1.1 Introduction 1.2 Component of Environment a. Atmosphere b. Hydrosphere c. Lithosphere d. Biosphere 1.3 Importance of Environment 1.4 Need for public Awareness 1.5 Concept of Ecology 1.6 Ecosystem 1.7 Component of Ecosystem a. Abiotic b. Biotic 1.8 Balanced Ecosystem 1.9 Ecological Pyramid a. Pyramid of Numbers b. Pyramid of biomass c. Pyramid of Energy 1.10 Biogeochemical Cycles a. Hydrological cycle b. Carbon cycle c. Nitrogen cycle d. Phosphorous cycle e. Sulphur cycle 1.11 Biodiversity
Unit-II Environmental Problems	2a Describe Acid Rain 2b Describe Ozone layer depletion 2c Explain Green House effect	2.1 Environmental problems in present world 2.2 Acid Rain a. Causes of acid rain b. How acid rain affects the

		<p>environment</p> <p>c. Remedial measures to prevent acid rain</p> <p>2.3 Ozone layer Depletion</p> <p>a. What is stratospheric ozone?</p> <p>b. Ozone layer depletion</p> <p>c. Ozone chemistry</p> <p>d. the ozone hole: the science</p> <p>e. Consequences ozone depletion</p> <p>f. Ultraviolet and Health</p> <p>2.4 Green House Effect</p> <p>a. Human influence on the climate</p> <p>b. Green house gases</p> <p>c. The importance of methane</p> <p>d. Effect of Green house-effect</p> <p>2.5 International policies for climate change</p>
Unit-III Air and Noise Pollution and its Control	<p>3a list various sources of air pollution , pollutants & Air quality Index with values</p> <p>3b State adverse effects of air pollution</p> <p>3c Describe remedial measures to control air pollution</p> <p>3d Enlist sources of noise pollution</p> <p>3e State adverse effects of noise pollution</p> <p>3f Describe remedial measures to control noise pollution</p>	<p>3.1 Introduction</p> <p>3.2 Air-pollutants</p> <p>a. Primary</p> <p>b. secondary</p> <p>3.3 Sources of air pollutant</p> <p>a. Anthropogenic sources</p> <p>b. Natural sources</p> <p>3.4 Air quality Index</p> <p>3.5 Health effect of air pollution</p> <p>3.6 Efforts to Reduce Air Pollution</p> <p>a. Control pollutants at source</p> <p>3.7 Introduction</p> <p>3.8 Computation of Noise pollution</p> <p>3.9 Noise measurement instruments</p> <p>3.10 Sources of noise</p> <p>3.11 Impacts of Noise</p> <p>3.12 Control of noise pollution</p> <p>a. control at source</p> <p>b. control in transmission path</p> <p>3.13 c. using protection equipments</p>
Unit-IV Water Pollution	<p>4a Enlist sources of water pollution</p> <p>4b State adverse effects of water pollution</p> <p>4c Describe treatment to control water pollution</p> <p>4d Measure pollutants</p> <p>4e Describe procedure for sampling</p> <p>a. Physical characteristics</p> <p>b. chemical characteristics</p> <p>c. biological characteristics</p>	<p>4.1 Introduction</p> <p>4.2 Sources of Pollution</p> <p>a. point source</p> <p>b. non-point source</p> <p>4.3 Groundwater pollution</p> <p>4.4 Causes of Pollution</p> <p>4.5 Measurement of pollutants</p> <p>a. sampling</p> <p>b. Physical characteristics</p> <p>c. chemical characteristics</p> <p>d. biological characteristics</p> <p>4.6 Control of pollution</p> <p>a. sewage</p> <p>b. Industrial wastewater</p> <p>c. agricultural wastewater</p> <p>d. construction site storm water</p> <p>4.7 e. storm water from urban area</p>

Unit-V Land, Radio-active and Thermal Pollution	5a Describe causes of land pollution 5b Explain control measures to prevent land become polluted 5c State sources of radio-active pollution 5d Describe control measures for radio-active pollution 5e Describe Effects of Radioactive pollution 5f Enlist sources of thermal pollution 5g State adverse effects of thermal pollution 5h Describe Solution to overcome the problem	5.1 Introduction 5.2 Causes of land pollution 5.3 Effect of Land pollution 5.4 Solution for Land pollution 5.5 Introduction 5.6 Causes of Radioactive pollution 5.7 Effects of Radioactive pollution 5.8 Radioactive waste management 5.9 Introduction 5.10 Causes for thermal pollution 5.11 Major problems due to thermal pollution 5.12 Solution to overcome the problem
Unit-VI Environment Impact Assessment	6a Explain Environmental Impact Assessment(EIA) 6b Explain the process/method of environmental assessment. 6c State the format of EIA 6d Evaluate the quality of environmental impact assessment	6.1 Purpose of EIA 6.2 Strategic environmental assessment 6.3 Environmental assessment process 6.4 Environmental Impact Statement 6.5 EIA report 6.6 Advantages and constraints in use and results

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	In Introduction to Environmental Engineering And Ecology	7	4	4	4	12
II	Environmental Problems	5	3	3	3	9
III	Air and Noise Pollution and its Control	8	4	4	6	14
IV	Water Pollution	8	3	3	4	10
V	Land, Radio-active and Thermal Pollution	7	5	5	7	17
VI	Environment Impact Assessment	7	2	2	4	8
Total:		42	21	21	28	70

Legends: R = Remember, U = Understand, A= Apply and above Level (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/PRACTICAL:

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.

No	Unit No.	Exercise (outcomes in psychomotor domain)	Hours
1.	All	Case study of environmental associated problems	04
2.		Draw Sketches with description (any Five)	Home Assignment
	All	1 Temperature variation in atmosphere 2 Balanced Ecosystem 3 Estonian pyramid 4 Hydrological cycle 5 Carbon cycle 6 Nitrogen cycle 7 Construction of green house 8 Fabric filter 9 Wet collectors 10 Absorbers cyclones 12 Vapour condensers 13 Electrostatic Precipitators	
3.		Laboratory Experiments	10
	All	1. Determine pH value of water sample 2. Determine Turbidity of water sample 3. Determine total dissolved solids in water sample 4. Determine B.O.D. of domestic wastewater sample 5. Determine C.O.D. of industrial wastewater sample	
4.		Visits	06
	All	1. Industry having air-pollution control measures adopted. 3. Nearby GPCB laboratory 3. Industry where stake-sampling can be carried out 4. Visit Chemical industry and write a report mentioning the impact on nature of that particular industry Note: submit detailed report on visits carried out	
5.		Seminar:	06

	All	The topic for the seminar should be given to the group of three students and they shall be asked to defend the seminar in presence of teacher and other students. Each student is required to defend the seminar individually	
Total			30

8. SUGGESTED STUDENT'S ACTIVITIES

- i. Visit nearby polluted-site, photographed it and suggest necessary measures to minimise it.
- ii. Make photo-collection/videos of pollution emission points
- iii. Surf websites of NGOs working for environmental protection and prepare a report

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. Show Charts/Pictures/videos of Different Polluted Sites and of Pollution Control Projects and Events,
- ii. Arrange visit to different effluent treatment plants, solid waste segregation and disposal plants at industries and civic bodies.

10. SUGGESTED LEARNING RESOURCES

(A) List of Books:

No	Name of book	Author	Publisher
1	Textbook of Environmental Engineering	P. Venugopala Rao	PHI Learning Pvt. Ltd.
2	Ecology, the link between the natural and the social sciences	Eugene Pleasants Odum	Oxford and IBH Publishing
3	Environmental Engineering: A design approach	Arcadio P. Sincero and Gregoria A. Sincero	Tata Mc-Graw Hill Publications
4	Air Pollution	M N Rao H V N Rao	Tata Mc-Graw Hill Publications
5	Chemistry for Environmental Engineering and Science	Clair Sawyer, Perry McCarty and Gene Parkin	Tata Mc-Graw Hill Publications
6	Environmental Noise Pollution-Causes, Evils, Legislation and Control	Dr. Vijendra Mahandian	Deep & Deep Publications Pvt Ltd
7	Environmental Chemistry	S. K. Benerji	PHI Learning Pvt.Ltd.
8	Water Pollution	B K Sharma	GOEL publishing House, Meerut
9	Water pollution & Disposal of Waste Water on Land	U.N.Mahida	Tata McGraw Hill
10	Environmental Pollution Control Engineering	C S Rao	New Age International

			Publishers
11	Water and Waste water Engineering	Gorden ,Fair& Gayer Okun	John willey& Sons
12	Pollution-Causes, Effects and Control	Roy M Harrison	The Royal Society of Chemistry
13	Conducting Environmental Impact assessment in Developing Countries	P. Modak A K Biswas	United Nations University Press
14	Climate Change and India: Vulnerability assessment and Adaption	P R Shukla Subodh K Sharma and Others	Universities Press (India) Pvt Ltd.
15	Global Environmental Issues- A Climatological Approach	David D. Kemp	Routledge

(B) List of Major Equipment/Materials:

- i. Spectrophotometer
- ii. Water Analysis Kit
- iii. B.O.D. Incubator
- iv. Reflux apparatus
- v. Sample treatment plants

(C) List of Software/Learning Websites

- i. www.envfor.nic.in/division/introduction-8
- ii. www.ce.ncsu.edu
- iii. www.ce.cmu.edu
- iv. research.ce.udel.edu
- v. [moef.nic.in/sites/default/files/ngrba/EIA%20Report\(DraftFinal\).pd](http://moef.nic.in/sites/default/files/ngrba/EIA%20Report(DraftFinal).pd)

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. S. M. Mistry**, H.O.D. Civil Engg., Dr. S. & S. S. Ghandhy College of Engineering and Technology, Surat
- **Prof. B.V. Modi**, Principal BVPIT (DS), UMRAXH

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. J. P. Tegar**, Prof & Head, Department of Civil and Environmental Engineering
- **Prof. M. C. Paliwal**, Associate Professor, Department of Civil and Environmental Engineering