GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: TRANSPORTATION AND ENVIRONMENT
(COURSE CODE: 3356005)

Diploma Programme in which this course offered	Semester in which offered
Transportation Engineering	5th Semester

1. RATIONALE

Due to modernisation and population growth in recent times, transportation sector has grown immensely. However, on the flip side the growth in transportation sector is affecting environment in a negative way. The environmental impact of transport is significant because it is a major user of energy, and burns most of the world's petroleum. This creates air pollution, including suspended particulates. Air and noise pollution are two major negative impacts of this boom in transportation sector, the burning of fuel and emissions of CO2 also aids to Global warming. For sustainable development and control of these negative effects, it is essential to control and mitigate these negative impacts. At diploma level, students are expected to interpret the environmental issues related to the transportation for taking remedial measures to solve them.

2. LIST OD COMPETENCY

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

- **Plan strategies and methods to reduce negative impact on environment due to transportation.**

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.

i. Interpret environmental parameters.
ii. Collect sample and control automobile air pollution.
iii. Measure noise and control noise.
iv. Promote alternative fuels in transportation.
v. Assess environmental and risk impact due to transportation.

4. TEACHING AND EXAMINATION SCHEME

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

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

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in cognitive domains)	Topics and Sub-topics
Unit – I Environmental Issues due to Transportation	1a. Describe the environmental impact due to road transportation systems 1b. Compare the environmental impact due to diesel, petrol and CNG vehicles in road transportation 1c. Differentiate modes of surface, air, sea and road transportation 1d. Differentiate between air and noise pollution with respects to national and international standards. 1e. Compare road and railway transportation 1f. Describe the effect of oil spills in rivers and sees and their effect on water pollution. 1g. Focus on oil spills and water pollution due to oceanic traffic 1h. Discuss the effect of vibration on the environment	1.1 Road transportation: diesel, petrol, CNG-based 1.2 Rail transportation 1.3 Air transportation 1.4 Sea transportation 1.5 Surface transportation 1.6 Atmosphere and its composition 1.7 Vibrations
Unit – II Air Pollution	2a. Explain causes and effects of air pollution 2b. Distinguish the Air Quality Standards in India and Emission Standards for automobiles in India 2c. Compare the emission from diesel, petrol, CNG-based engines and methods to reduce automobile air pollution. 2d. Describe the method ambient air sampling and measurement	2.1 Pollutants: Types and characteristics 2.2 Air pollution: Types, Sources of air pollution: number and spatial distribution and their effects 2.3 Air Quality Standards in India: Emission Standards for automobiles in India, regulations related to air pollution due to transportation. 2.4 Analysis of air pollutants: Ambient Air Sampling.

Unit	Major Learning Outcomes (in cognitive domains)	Topics and Sub-topics
		2.5 Emission from diesel, petrol, CNG-based engines and methods to reduce them
Unit – III Noise Pollution	3a. Explain measurement and methods of noise pollution control 3b. Describe noise pollution due to transportation , its causes, effects and noise level standards	3.1 Noise level standards 3.2 Noise pollution due to automobiles: Types, causes, effects, measurement of noise pollution, control of noise pollution with focus on noise pollution
Unit – IV Alternative Transportation Fuels	4a. Compare the use of alternative fuels used in transportation 4b. With sketches, describe the process of production of alternative fuels 4c. Compare the performance of vehicles based on electric and fuel cells	4.1 Fuels: Types, Kerosine, Petrol, Diesel, CNG, LPG, Biogas, biodiesel and blending issues 4.2 Comparison of Environmental friendly fuels used in transportation
Unit – V Environmental Impact Assessment	5a. Justify the need Environmental Impact Assessment in Transportation projects. 5b. Describe the different EIA methodologies 5c. Describe the concept of ERA (Environmental Risk Assessment)	5.1 EIA in Transportation 5.2 Methodology of EIA. 5.3 Limitations of EIA. 5.4 Environmental Risk Assessment.

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Environmental Issues due to Transportation	10	4	6	4	14
II	Air Pollution	12	4	6	8	18
III	Noise Pollution	6	2	4	6	12
IV	Alternative Transportation Fuels	6	4	6	2	12
V	Environmental Impact Assessment	8	4	8	2	14
Total		**42**	**20**	**32**	**18**	**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 EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills 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 (Outcomes in cognitive domain)	Approx. Hrs. Required
1	II	Prepare detailed chart of various air pollutants and sources of air pollution.	2
2	II	Use Air Pollution meters.	6
3	III	Measure noise emitted by various automobiles using sound level meter.	2
4	III	Measure quality of exhaust / emissions emitted by various automobiles using COx meters.	
5	IV	Test of Alternative Transportation fuels.	6
6	V	Prepare EIA reports for different purposes	4
7	I to V	Present a seminar and report in groups of not more than three on topics related to the curriculum covering latest developments and new trends with regard to transportation and environment	10
Total			**30**

8. SUGGESTED STUDENT ACTIVITIES

i. Undertake laboratory visits of pollution control departments and prepare reports
ii. Study of available EIA reports

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Show video clips related to Air Pollution, noise pollution control equipments and interact with the students by asking questions.
ii. Show Picture Clips through Power Point regarding ambient air sampling, noise pollution measurement and its Commercial reports

10. SUGGESTED LEARNING RESOURCES

(A) List of Books

S. No.	Title of Books	Author	Publication
1.	Air Pollution from Motor Vehicles: Standards and Technologies for controlling emissions	Faiz, Asif , Weaver and Walsh	World Bank
2.	Air Pollution	Wark and Warner	Cram101
3.	Fundamentals of Air Pollution	Vallero, Daniel	Academic Press
4.	Traffic Engg and Transport Planning	Kadiyali, L.R.	Khanna
5.	Environmental Impact Assessment	Trivedi, P.R.	A.P.H. Publishing
6.	Environmental Impact Assessment	Shrivastava, A.K.	A.P.H. Publishing
7.	Noise Pollution	Agarwal, S.K.	A.P.H. Publishing
8.	Alternative Transportation Fuels	Gajendra Babu, M.K., Subramanian K.A.	CRC Press

B) Major Equipment/Materials with Broad Specifications

i. High and Low volume sampler
ii. Noise pollution control equipment

C) Software/Learning Website

i. www.afdc.energy.gov/fuels/index.html
ii. en.wikipedia.org/wiki/Alternative_fuel
iii. www.motortrend.com/roadtests/alternative

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. P.A. Pandya**, Lecture in Civil Engineering, G.P. Himatnagar
- **Prof. K.P. Jasodani**, Lecture in Civil Engineering, G.P. Dahod

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. Subrat Roy**, Professor, Department of Civil and Environmental Engineering
- **Dr. Joshua Earnest,** Professor, Department of Electrical and Electronics Engineering