GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: HIGHWAY CONSTRUCTION
(COURSE CODE: 3356002)

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

1. RATIONALE

Roads are the dominant mode of transportation in India today. They carry almost 90 percent of the country's passenger traffic and 65 percent of its freight. However, most highways in India are narrow and congested with poor surface quality, and 40 percent of India's villages do not have access to all weather roads. Also with rapid mechanization of construction industry, we experience unprecedented activities, and uncertainties in the highway sector. Thus Highway Construction has become an integral facet of present day highway projects. Therefore, knowledge and understanding of various construction aspects of raod are very important for engineers working at site in order to make transportation system safe and efficient. At diploma level, students are expected to study about these aspects of raod so as to develop their understanding in order to apply their knowledge in construction industry.

2. LIST OF COMPETENCY

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

- **Supervise construction works of bituminous and cement concrete pavements in plain, swampy & hilly areas as per specifications and drawings.**
- **Design Roads for hilly, swampy and desert Areas.**

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.

1. Explain procedure for embankment construction, different types of pavement constructions and also the process of recycling of pavement materials.
2. Interpret the technology of construction for construct earthen, gravel, water bound and wet mix macadam roads.
3. Deploy labor and machinery in road construction effectively
4. Explain design guide lines for roads for hilly, swampy and desert areas

4. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Schedule				
				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 Theory Practice; **P** - Practical; **C** – Credit **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topic and Sub-topics
Unit-I Highway Construction Principles	1a. Describe in the brief developments in road construction. 1b. Describe the construction procedure of roads with ordinary and hard rock formation cutting for embankment. 1c. Explain need of ground improvements.	1.1 Developments in road construction 1.2 Embankment construction: Formation cutting in ordinary soil and hard rock 1.3 Ground improvements
Unit-II Bituminous and Other Pavement Construction	2a. Describe different types of pavement Construction 2b. Differentiate bituminous base and surface courses 2c. State the points of special attention to be paid for coating prime , tack , seal coats. 2d. Explain the process of recycling of bituminous pavement materials	2.1 Seasonal limitations of pavement Construction 2.2 Bituminous base and surface courses : prime , tack, seal coats, bituminous- bituminous penetration macadam, surface dressing, premix carpet and bituminous concrete 2.3 Recycling of bituminous pavement materials 2.4 Construction of earthen, gravel and water bound macadam, wet mix macadam roads
Unit-III Cement Concrete Pavement Construction	3a. Explain construction of cement concrete pavement, plants and required for its construction 3b. Differentiate reinforced and pre-stressed concrete pavements. 3c. State types of construction joints 3d. Describe the role of joints filler and sealer in pavement.	3.1 Plants and required, construction pavement, 3.2 Types of construction joints, 3.3 Joints filler and sealer, reinforced, Pre-stressed .

Unit	Major Learning Outcomes (in cognitive domain)	Topic and Sub-topics
Unit- IV Desert, Swampy and Hilly Areas Road Construction	4a. Describe the steps to geometric design of roads in hilly area. 4b. Describe the design and procedure to construct hill roads, retaining and revetment walls 4c. Describe the design and procedure to construct roads in swampy area 4d. Explain principle of road location in swampy and desert area 4e. State design guidelines for desert area roads	4.1 Hilly area road: alignment , Geometric design, 4.2 Design and construction of -hill roads, retaining, revetment walls 4.3 Location and design of roads in swampy area 4.4 Desert area roads: principles of road location, guidelines for design.
Unit-V Road Construction Machineries	5a. Compare role of labour v/s machinery in road construction 5b. Classify road construction machinery – Earthwork , Rock excavation, Transporting, Compaction , Bituminous and Cement Concrete road equipment / machinery. 5c. Describe applications of road equipment 5d. Describe the factors determining the usage charges of road construction machinery / equipment	5.1 Role of labor v/s machinery in road construction 5.2 Earthwork machinery 5.3 Rock excavation machinery 5.4 Transporting Equipment 5.5 Compaction Equipment 5.6 Bituminous concrete road equipment 5.7 Cement Concrete road making Equipment 5.8 Equipment Usage charges

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Highway Construction Principles	4	3	2	3	08
II	Bituminous and other Pavement Construction	12	8	6	6	20
III	Cement Concrete Pavement Construction	8	3	5	5	13
IV	Desert, Swampy and Hilly Areas Road Construction	8	3	5	6	14
V	Road Construction Machineries	10	5	5	5	15
	Total	**42**	**22**	**23**	**25**	**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/PRACTICAL/EXPERIMENTS.

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 psychomotor domain)	Approx. Hrs. Required
1	I	Prepare a History of road construction	2
2	II	Prepare chart showing Stages of construction for bituminous road	2
3	III	Prepare chart showing Stages of construction for cement concrete pavement	2
4	V	Sketch the highway construction machineries with their functions.	4
5	III	Prepare charts showing details of construction joints in cement concrete roads.	4
6	IV	Prepare chart showing construction procedure in hilly and swampy areas	2
7	III	Prepare report on construction joints.	2
9	I to V	Seminar (Topic of Seminar shall be given to a group of three to five students. The students are required to submit & present / defend the Seminar in presence of students & teachers	6
		Total	**28**

8. SUGGESTED STUDENT ACTIVITIES

i. Undertake site visit related to road construction works and prepare report.
ii. Explore internet for advance and latest practices being used in Highway construction and prepare report.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Show video clips of road construction activity and interact with the students by asking questions
ii. Arrange visit to a Highway construction project and explain equipment in use and activities being carried out.
iii. Show Picture Clips through Power Point regarding road construction

10. SUGGESTED LEARNING RESOURCES

(A) List of books

S. No	Title of Book	Author	Publication
1.	Principles of Transportation engineering	Partha Chakroborty & Animesh Das	
2.	Highway Engineering	Khanna ,S.K. and C.E.G.Justo	Nem chand Bros
3.	Principles and practice of Highway engineering	Kadiyali, L. R.	Khanna Publications Delhi
4.	MOST Standard for Highway constructions		

(B) Software/Learning Websites

i. http://www.tecmagazine.com/
ii. http://en.wikipedia.org/wiki/highway construction(transportation)
iii. http://en.wikipedia.org/wiki/highway construction machineries(transportation)

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty members from polytechnics

- **Prof. Mrs. S. B. Khara** , Lecturer in Civil Engineering, G.P. Himatnagar
- **Prof. P.A. Pandya,** Lecturer in Civil Engineering, G.P. Himatnagar

Coordinator and Faculty Member from NITTTR Bhopal

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