GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. SEMESTER: V
CIVIL ENGINEERING

Subject Name: **Highway Engineering**
Subject Code: **150601**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Internal Assessment (I)**
3	0	2	5	70	30	50

MODULE - I	
1.	**Highway Planning and Development:** Highway planning in India, Development, Rural and urban roads, Road departments in India, Road classification, Road authorities i.e. IRC, CRRI, NHAI, etc.
2.	**Field Surveys:** Reconnaissance, Aerial surveys, Location surveys, Location of bridges, Problems in rural and urban areas.

MODULE - II	
1.	**Highway Geometric Design:** Topography and physical features, Cross section elements like carriageway width, formation width, right of way, etc., friction, Light reflecting characteristics, roughness, camber, sight distances, horizontal alignment, design speed, minimum radius, super-elevation, transition curve, gradients, design of summit and valley curves.

MODULE – III	
1.	**Road Sub-Grade:** Soil and its classification, Soil investigation, CBR, Plate load test, K-value test.
2.	**Road Material:** Aggregates and their types, physical and engineering properties, Fillers, Bitumen, Characteristics, Emulsions and cutbacks, Basic tests on all materials.

3.	**Low Cost Roads:** Stabilized earth, Gravel roads, W.B.M. roads, High Cost Roads: bituminous roads, cement concrete roads.
4.	**Highway Pavements:** Design of flexible (G.I. method and CBR method using million standard axles) and rigid pavements (Fatigue concept of pavement design), Maintenance of pavements.

MODULE - IV	
1.	**Highway Drainage:** Surface and sub-surface drainage arrangements, sketches and design.
2.	**Hill Roads:** Elementary principles of alignment in hilly areas and drainage.
3.	**Roadside Developments:** Arboriculture, street lighting.
4.	**Road Administration and Finance:** Financing of road projects, administration of roads, PPP models, Road safety audit.

MODULE – V	
1.	**Traffic Engineering:** Road user characteristics, vehicular characteristics, traffic flow characteristics, speed, traffic volume studies, parking studies - definition, purpose, types, survey methods. Accident studies - purpose, types, causes, collision diagram, condition diagram, preventive measures. Traffic control devices like pavement marking, signs, signals. Traffic management, various types of intersection and their design criteria.

Note: Each module has 20 percent weightage.

Term work shall be based on the following experiments.

List of Practical:

1. Introduction to Highway Engineering Laboratory Equipment.
2. California Bearing Ratio (CBR) Test.
3. Aggregate Impact Test.
4. Flakiness Index and Elongation Index Test for Aggregate.
5. Los Angeles Abrasion Test / Deval Abrasion Test
6. Marshall stability test on Bitumen mix.
7. Specific gravity and Water Absorption test for Aggregate.
8. Penetration test for Bitumen.
9. Softening point test for Bitumen.

10. Ductility test for Bitumen.
11. Flash and Fire Point test for Bitumen.
12. Specific gravity test for Bitumen
13. Viscosity Test for Bitumen.

Reference Books:

1. L.R. Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.
2. L.R. Kadiyali, "Traffic Engineering and Transport Planning," Khanna Publishers, New Delhi.
3. Dr. S.K. Khanna and Dr. C.E. G. Justo, "Highway Engineering", Nem Chand & Bros., Roorkee.
4. S.K. Sharma, "Principles, Practice and Design of Highway Engineering", S. Chand & Co., New Delhi.
5. IRC – 37 "Guidelines for Design of flexible Pavements", IRC, New Delhi, 2001.
6. IRC – 67 "Code of Practice for Road Signs", IRC, New Delhi – 2001.
7. IRC: 58, 2002: "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", IRC, N. Delhi, December, 2002.