Marwadi University
Marwadi Chandarana Group

Bachelor of Technology

Civil Engineering

Highway Engineering

01CI1503

Objective of the Course:

- To understand the design of road network which is safe, economic and time saving forpassengers and goods movements.
- To impart knowledge to the civil engineering students on highway planning, geometric design, traffic studies.
- To make students understand about various components of pavement structure and maintenance.
- To make students able to perform various test related to highway materials.

Credit Earned: 04

Student's learning outcomes:

After successful completion of the course, it is expected that students will be able to,

1. Understand the importance of highway planning and the fundamentals of traffic engineering.
2. Design the various of geometric elements of highway pavement.
3. Identify the different properties of pavement materials and recommend maintenance strategies for highway pavement.
4. Evaluate the different properties of traffic and recommend strategies for traffic management.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	00	02	04	50	30	20	25	25	150

Detailed Syllabus

Sr.No	Title of the Unit	Hours
1	**Introduction – Highway Engineering**	**2**
	Scope of highway engineering, Development of Highway in India, 20 years Road Planning,	

2	**Geometric Design of Highway**	**10**
	Cross-sectional elements –width of carriageway, road surface, camber **Sight Distance** – types of sight distance: SSD, OSD, ISD, HSD, Design of Horizontal and Vertical curve- alignment of curve, Super Elevation and Gradient, Summit and Valley curves	
3	**Highway Material**	**10**
	Engineering and physical properties and Basic Tests: materials used in highway construction **Subgrade Soil** - Importance, characteristics, index, properties, evaluation of soil structure, **Aggregate-** function, properties, test, **Bitumen –** Chemical composition of bitumen, types and characteristics, function, test, **Bituminous Material-** Cutback bitumen- types, application and specifications, **Bitumen emulsion**- types, application and procedure of preparation, **Bituminous Paving mixes**- Requirement, Design, Marshall method for bituminous mix design.	
4	**Pavement**	**8**
	Types of pavements, comparison of flexible and rigid pavement, components of pavement and its function, factors affecting design, **Failure and maintenance of roads-** objectives of maintenance, classification of maintenance, failure in flexible pavement and rigid pavement, **Highway drainage:** introduction, importance, requirements, types	
5	**Traffic Engineering**	**12**
	Basic Elements of traffic engineering, Road user characteristics, vehicular characteristics, **Traffic volume study** – objectives, methods, presentation of data, **Traffic speed study** – objectives, types, analysis of speed data, Speed & Delay study – necessity and methods, O-D studies, parking studies, accident studies, **Traffic Capacity**-Types, Factors affecting, Concept of LOS, PCU, IRC specifications.	
	Total	**42**

List of Practicals

Sr. No	**Topic name**
1	Aggregate Abrasion test
2	Aggregate Impact test
3	Combined Flakiness and Elongation Index
4	Specific gravity of aggregate
5	Bitumen - Penetration test
6	Bitumen - Softening Point test
7	Bitumen - Ductility Test
8	Bitumen - Viscosity Test

9	Bitumen – Specific gravity
10	Marshall Stability Test
11	Highway Geometric Design
12	Interrelationship between traffic parameters

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve an effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	25%	10%	25%	20%	10%

Instructional Method and Pedagogy:

1. Prerequisite of the course and its pattern shall be discussed on the commencement of the course.
2. Lectures shall be conducted in class room using various teaching aids.
3. Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation.
4. At the end of each unit/topic an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.
5. The laboratory experiments are planned in such a way that it covers the practical aspects of the course contents. The performance of these experiments shall bring the clarity of the theoretical concepts which the students have studied during the academic sessions.

Recommended Study Material

1. Highway Engineering by S.K. Khanna and C.E.G. Gusto, A.Veeraragavan, Nem Chand and Bros, Roorkee.
2. Traffic Engineering and Transport planning by Dr. L.R. Kadiyali, Khanna Publishers.
3. Highway Engineering by Dr. L.R. Kadiyali, Khanna Publishers
4. Principle and practices of Bridge Engineering by S.P.Brindra, DhanpatRai and Sons
5. IRC 37 "Guidelines for design of Flexible Pavement", IRC, New Delhi, 2001.
6. IRC 58 2002, "Guidelines for design of Plain Jointed Rigid Pavement For Highways", IRC, New Delhi, 2002.
7. IRC 67 " Code of Practice for Road Signs", IRC, New Delhi, 2001.
8. IRC 106 "Guidelines For Urban Capacity for Plan Areas", IRC 1990