INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)**
SEMESTER	**5**
COURSE TITLE	**HIGHWAY ENGINEERING**
COURSE CODE	**01CI1503**
COURSE CREDITS	**4**

Objective:

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

Course Outcomes: After completion of this course, student will be able to:

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

Pre-requisite of course:..

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction** Scope of highway engineering, Development of Highway in India, 20 years Road Planning	2
2	**Geometric Design of Highway** 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	10

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Contents : Unit	Topics	Contact Hours
3	**Highway Material** 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.	10
4	**Pavement** 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	8
5	**Traffic Engineering** 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	12
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment-1** Aggregate Abrasion test	2
2	**Experiment-2** Aggregate Impact test	2
3	**Experiment-3** Combined Flakiness and Elongation Index	2
4	**Experiment-4** Specific gravity of aggregate	2
5	**Experiment-5** Aggregate Crushing Test	2
6	**Experiment-6** Bitumen - Softening Point test	2
7	**Experiment-7** Bitumen - Ductility Test	2
8	**Experiment-8** Bitumen - Viscosity Test	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
9	**Experiment-9** Bitumen – Specific gravity	2
10	**Experiment-10** Bitumen - Penetration test	2
11	**Experiment-11** Marshall Stability Test	4
12	**Tutorial-1** Highway Geometric Design	2
13	**Tutorial2** Interrelationship between traffic parameters	2
Total Hours		**28**

Textbook :

1 Highway Engineering, S.K. Khanna and C.E.G. Gusto, A.Veeraragavan, Nem Chand and Bros, Roorkee, 2019

References:

1 Highway Engineering, Highway Engineering, Dr. L.R. Kadiyali, Khanna Publishers, 2018

2 Traffic Engineering and Transport planning, Traffic Engineering and Transport planning, Dr. L.R. Kadiyali, Khanna Publishers, 2017

Suggested Theory Distribution:

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

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	25.00	10.00	25.00	20.00	10.00

Instructional Method:

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

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Instructional Method:

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

Supplementary Resources:

1 https://nptel.ac.in/courses/105101087

2 https://nptel.ac.in/courses/105105107

3 https://archive.nptel.ac.in/courses/105/107/105107220/

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