HIGHWAY ENGINEERING
(SYLLABUS)

Course Code	23CE3602	Year	III	Semester	II
Course Category	Professional Core	Branch	CIVIL	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Engineering Mathematics & Surveying
Internal Evaluation	30	Semester End Evaluation	70	Total Marks:	100

Course Objectives:

The objective of this course is to:

1. To impart different concepts in the field of Highway Engineering.
2. To acquire design principles of Highway Geometrics
3. To acquire design principles of Traffic Engineering
4. To understand the materials used in highways
5. To design the flexible and rigid pavements

Course Outcomes:

Course will enable the student to:

CO	Statement	Blooms level
CO 1	**Describe** the highway development and planning in India	L3
CO 2	**Analyze** geometric design of highway alignment	L4
CO 3	**Demonstrate** traffic management and traffic intersection	L3
CO 4	**Evaluate** tests on aggregates, bitumen and Marshall stability	L4
CO 5	**Design** and constructions of flexible and rigid pavements	L4

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2										2	2
CO2	2	2										2	3
CO3	3	3										3	2
CO4	2	2			2	3						2	3
CO5	2	2										2	3

Syllabus

Unit No	Content	Mapped COs
I	**Highway Planning and Alignment**: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans– First, second, third road development plans, Planning Surveys; Highway Alignment- Factors affecting Alignment-Engineering Surveys – Drawings and Reports	**CO1, CO2**
II	**Highway Geometric Design:** Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical Alignment-Gradients- Vertical curves.	**CO2, CO1**
III	**Traffic Engineering:** Basic Parameters of Traffic-Volume, Speed and Density-Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections Design; Design of Traffic Signals – Webster Method –IRC Method.	**CO3, CO4**
IV	**Highway Materials:** Sub grade soil: classification –Group Index–Subgrade soil strength –California Bearing Ratio–Modulus of Subgrade Reaction. Stone aggregates: Desirable properties– Tests for Road Aggregates–Bituminous Materials: Types–Desirable properties—Tests on Bitumen -Bituminous paving mixes: Requirements – Marshall Method of Mix Design	**CO4, CO5**
V	**Design of Pavements:** Types of pavements; Functions and requirements of different components of pavements; Design Factors ***Flexible Pavements****:* Design factors–Flexible Pavement Design Methods–CBR method–IRC method–Constructions of Flexible Pavement – IRC method **Rigid Pavements:** Design Considerations – wheel load stresses – Temperature stresses –Frictional stresses–Combination of stresses–Design of slabs–Design of Joints–IRC method–. Constructions of Rigid Pavement – IRC method	**CO5, CO4**

Learning Resource(s)
Text Book(s)
1. Highway Engineering, (9th edition) by Khanna, S.K. and Justo, C.E.G., Nem Chand Bros, Roorkee, 2010. 2. Traffic Engineering and Transportation Planning, (7th edition) by Kadiyali, L.R., Khanna Publishers, New Delhi, 2010. 3. Specifications for Roads and Bridges - Manual for Maintenance of roads, Most publications, 1976.
Reference Book(s)

1. Fundamentals of Transportation Engineering, (3rd edition) by Papacostas, C.S., Prentice Hall of India Pvt.Ltd, New Delhi, 2009.
2. Principles of Highway Engineering by Kadiyali, L.R., Khanna Publishers, New Delhi, 2012.
3. Traffic Planning and Design by Saxena, Dhanpat Rai Publishers, New Delhi, 2010.
4. Transportation Engineering - An Introduction, (3rd edition) by JotinKhisty. C, Prentice Hall, Englewood Cliffs, New Jersey, 2012.
5. IRC Code for flexible pavement – IRC – 37 -2001.

e- Resources & other digital material

1. https://nptel.ac.in/courses/ 105/101/105101087
2. https://nptel.ac.in/courses/ 105/104/105104098