

**20CE3502 – HIGHWAY ENGINEERING**

<b>Offering Branches</b>	CE		
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial- Practical:	3-0-0
Prerequisites:	20BS1101 – Engineering Mathematics – I 20CE3306 – Surveying	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

**Course Outcomes**

Upon successful completion of the course, the student will be able to:

<b>CO1</b>	<b>Choose</b> the highway development and planning in India	K3
<b>CO2</b>	<b>Analyze</b> geometric design of highway alignment and management of traffic	K4
<b>CO3</b>	<b>Demonstrate</b> traffic intersection and choose material for highway	K3
<b>CO4</b>	<b>Discriminate</b> with the design procedures of flexible and rigid pavements	K4
<b>CO5</b>	<b>Focus</b> on the construction and maintenance issues related to highways	K4

**Contribution of Course Outcomes towards achievement of Program Outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	2	2											2	2
<b>CO2</b>	2	2											2	3
<b>CO3</b>	3	3											3	2
<b>CO4</b>	2	2			2	3						3	2	3
<b>CO5</b>	2	2											2	3
<b>Avg.</b>	<b>2</b>	<b>2</b>			<b>2</b>	<b>3</b>							<b>3</b>	<b>2</b>

**1- Low**

**2-Medium**

**3-High**

**Course Content**

<b>UNIT-1</b>	<p><b>HIGHWAY DEVELOPMENT</b> Highway development in India–Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.</p> <p><b>HIGHWAY PLANNING</b> Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Planning Surveys.</p>	<b>CO1</b>
<b>UNIT-2</b>	<p><b>HIGHWAY GEOMETIC DESIGN</b> Importance of Geometric Design- Highway Cross Section Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Super elevation and Extra widening- Design of Vertical alignment-Gradients- Vertical curves.</p> <p><b>TRAFFIC ENGINEERING AND MANAGEMENT</b> Traffic Volume Studies- Speed studies- Parking Studies - Road Accidents-Causes and Preventive measures - Road Traffic Signs – Types – Road markings-Types of Road Markings</p>	<b>CO2</b>
<b>UNIT-3</b>	<p><b>INTERSECTION DESIGN</b> Types of Intersections –Traffic Islands - Design of Traffic Signals –Webster Method –IRC Method. Types of Grade Separated Intersections- Rotary Intersection – Advantages and Disadvantages of Rotary Intersection.</p> <p><b>HIGHWAY MATERIALS</b> Subgrade soil: California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Tests for Road Aggregates – Bituminous Materials: Tests on Bitumen – Marshall Method of Mix Design.</p>	<b>CO3</b>
<b>UNIT-4</b>	<p><b>DESIGN OF FLEXIBLE PAVEMENTS</b> Objects &amp; Requirements of pavements – Types – Functions of pavement</p>	<b>CO4</b>

	components – Design factors – Flexible Pavement Design Methods – CBR method – IRC method <b>DESIGN OF RIGID PAVEMENTS</b> Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of Joints – IRC method	
<b>UNIT-5</b>	<b>HIGHWAY CONSTRUCTION</b> Types of Highway Construction – Construction of Gravel Roads – Construction of Water Bound Macadam Roads – Construction of Bituminous Pavements – Construction of Cement Concrete Pavements. <b>ADVANCES IN HIGHWAY CONSTRUCTION</b> Soil stabilisation, Soil-Cement Stabilisation, Soil-Lime Stabilisation	<b>CO5</b>
<b>Learning Resources</b>		
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Highway Engineering, (9th edition) by Khanna, S.K. and Justo ,C.E.G., Nem Chand Bros, Roorkee, 2010.</li> <li>2. Traffic Engineering and Transportation Planning, (7th edition) by Kadiyali, L.R., Khanna Publishers, New Delhi, 2010.</li> <li>3. Specifications for Roads and Bridges - Manual for Maintenance of roads, Most publications, 1976.</li> </ol>	
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Fundamentals of Transportation Engineering, (3rd edition) by Papacostas, C.S., Prentice Hall of India Pvt.Ltd, New Delhi, 2009.</li> <li>2. Principles of Highway Engineering by Kadiyali, L.R., Khanna Publishers, New Delhi, 2012.</li> <li>3. Traffic Planning and Design by Saxena, Dhanpat Rai Publishers, New Delhi, 2010.</li> <li>4. Transportation Engineering - An Introduction, (3rd edition) by Jotin Khisty. C, Prentice Hall, Englewood Cliffs, New Jersey, 2012.</li> <li>5. IRC Code for flexible pavement – IRC – 37 -2001.</li> <li>6. IRC Code for Rigid pavement – IRC – 58 – 2002.</li> </ol>	
<b>e- Resources &amp; other digital material</b>	<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/105/101/105101087">https://nptel.ac.in/courses/105/101/105101087</a></li> <li>2. <a href="https://nptel.ac.in/courses/105/104/105104098">https://nptel.ac.in/courses/105/104/105104098</a></li> </ol>	