

**Course Title: Concrete and Highway Materials Laboratory**

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER: V

Subject Code	15CVL58	IA Marks	20
Number of Lecture Hours/Week	03 (1hr tutorial + 2hr laboratory)	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03
<b>CREDITS – 02</b>		<b>Total Marks-100</b>	
<b>Course objectives:</b>			
<ul style="list-style-type: none"><li>To learn the principles and procedures of testing Concrete and Highway materials and to get hands on experience by conducting the tests and evolving inferences.</li></ul>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Part A: Concrete Lab</b>			
<b>1. Tests on Cement:</b> <ul style="list-style-type: none"><li>a. Normal Consistency</li><li>b. setting time</li><li>c. compressive strength</li><li>d. fineness by air permeability test</li><li>e. specific gravity</li></ul>		<b>6 Hours</b>	<b>L1, L2</b>
<b>2. Tests on Concrete:</b> <ul style="list-style-type: none"><li>a. Design of concrete mix as per IS-10262</li><li>b. Tests on fresh concrete:<ul style="list-style-type: none"><li>i. slump,</li><li>ii. compaction factor and</li><li>iii. Vee Bee test</li></ul></li><li>c. Tests on hardened concrete:</li></ul>		<b>9 Hours</b>	<b>L2,L3</b>

<ul style="list-style-type: none"> <li>i. compressive strength test,</li> <li>ii. split tensile strength test,</li> <li>iii. flexural strength test</li> <li>d. NDT tests by rebound hammer and pulse velocity test.</li> </ul>		
<b>3. Tests on Self Compacting Concrete:</b> <ul style="list-style-type: none"> <li>a. Design of self compacting concrete,</li> <li>b. slump flow test,</li> <li>c. V-funnel test,</li> <li>d. J-Ring test,</li> <li>e. U Box test and</li> <li>f. L Box test</li> </ul>	<b>3 Hours</b>	L2,L3
<b>Part B: High way materials Lab</b>		
<b>1. Tests on Aggregates</b> <ul style="list-style-type: none"> <li>a. Aggregate Crushing value</li> <li>b. Los Angeles abrasion test</li> <li>c. Aggregate impact test</li> <li>d. Aggregate shape tests (combined index and angularity number)</li> </ul>	<b>3 Hours</b>	<b>L1, L2</b>
<b>2. Tests on Bituminous Materials</b> <ul style="list-style-type: none"> <li>a. Penetration test</li> <li>b. Ductility test</li> <li>c. Softening point test</li> <li>d. Specific gravity test</li> <li>e. Viscosity test by tar viscometer</li> <li>f. Bituminous Mix Design by Marshall Method (Demonstration only)</li> </ul>	<b>9 Hours</b>	<b>L1, L2,L3</b>
<b>3. Tests on Soil</b> <ul style="list-style-type: none"> <li>a. Wet sieve analysis</li> <li>b. CBR test</li> </ul>	<b>6 Hours</b>	<b>L1, L2</b>
<b>Course outcomes:</b> After studying this course, students will be able to: <ul style="list-style-type: none"> <li>1. Conduct appropriate laboratory experiments and interpret the results</li> <li>2. Determine the quality and suitability of cement</li> <li>3. Design appropriate concrete mix</li> <li>4. Determine strength and quality of concrete</li> <li>5. Test the road aggregates and bitumen for their suitability as road material.</li> <li>6. Test the soil for its suitability as sub grade soil for pavements.</li> </ul>		
<b>Reference Books:</b> <ul style="list-style-type: none"> <li>1. M.L.Gambir, <b>“Concrete Manual”</b>, Danpat Rai and sons, New Delhi</li> <li>2. Shetty M.S, <b>“Concrete Technology”</b>, S. Chand &amp; Co. Ltd, New Delhi.</li> <li>3. Mehta P.K, <b>“Properties of Concrete”</b>, Tata McGraw Hill Publications, New Delhi.</li> <li>4. Neville AM, <b>“Properties of Concrete”</b>, ELBS Publications, London.</li> <li>5. Relevant BIS codes.</li> <li>6. S K Khanna, C E G Justo and A Veeraragavan, <b>“Highway Materials Testing Laboratory Manual”</b>, Nem Chand Bros, Roorkee</li> <li>7. L R Kadiyali, <b>“Highway Engineering”</b>, Khanna Publishers, New Delhi</li> </ul>		

8. Relevant IRC Codes
9. Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi