

## Course Syllabi with CO's

Faculty Name : <b>Bharathi B</b>				Academic Year: 2024-25			
Department: Civil Engineering							
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs of Pedagogy
				L	T	P	
<b>BCV403</b>	<b>Transportation Engineering</b>	<b>Core</b>	<b>Building materials</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>40 hours Theory+8-10 Lab Slots</b>
<b>Objectives</b>	<b>Course objectives:</b> This course will enable students to; <ul style="list-style-type: none"> <li>Gain knowledge of different modes of transportation systems and to learn the introductory concepts on Highway Engineering.</li> <li>Get insight to different highway materials and pavement design elements of a highway network.</li> <li>Realize the significance of road safety by incorporating the concepts of Traffic Engineering.</li> <li>Understand to different aspects of geometric elements of railway system and evaluate the material quantity required for track laying</li> <li>Gain knowledge about various components of an Airport and its runway design.</li> </ul>						
<b>TOPICS COVERED AS PER SYLLABUS</b>							
<b>MODULE-1</b>							
TRANSPORTATION ENGINEERING: Introduction, Different Modes of Transportation, M R Jayakar Committee recommendations, Road Classifications and Road Patterns.							
Highway Alignment: Factors affecting highway alignment, Engineering surveys for alignment conventional and modern methods.							
Highway Geometric Design: Factors affecting geometric design of roads, Cross Sectional Elements, Sight distances, Horizontal alignment- Transition curve, superelevation, Extradwidening, Vertical alignment–gradients, summit and valley curves. <i>(No derivations)</i>							
<b>MODULE-2</b>							
HIGHWAY MATERIALS AND PAVEMENTS: Desirable properties of aggregates, soil subgrade & Bitumen, Application of bituminous emulsion, Desirable properties of Bituminous Mixes							
Pavement Design: Factors Controlling design of highway pavements, Pavement types, component parts of pavements and their functions; types of joints used in rigid pavement. Critical stresses in flexible and rigid pavement.							
Highway Drainage: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, Types of cross drainage structures their choice and location.							
<i>Problems on design of Longitudinal drain. (L2, L3)</i>							
<b>MODULE-3</b>							
TRAFFIC ENGINEERING: Objectives and scope of Traffic Engineering. Traffic Characteristics: Road user characteristics, vehicular characteristics – static and dynamic characteristics, Reaction time of driver and PIEV theory							
Types of traffic engineering studies-volume, spot speed, speed and delay, parking, accident, origin & destination, objectives of studies and data collection, method of study, analysis. PCU concept, factors affecting and PCU at different locations and applications. Traffic signs, Signal design by IRC method; Types of intersections.							
<i>Problems on Spot speed studies, Speed and delay studies, accident studies, Signal design by IRC method. (L2, L3)</i>							
<b>MODULE-4</b>							
RAILWAY ENGINEERING: Permanent way and its requirements, Gauges and types, Typical cross sections single and double-line BG track, Coning of wheels and tilting of rails, Rails-Functions requirements,types and defects of rails. Sleepers and Ballast: Functions, requirements, Track fitting and fasteners, Calculation of quantity of materials required for laying a track, Points & crossings,							
Railway Station and Yards. Metro train & high speed train- Design factors considered.							
<i>Problem on Quantity calculation for laying railway track. Super-elevation (L1, L2)</i>							

### MODULE-5

**AIRPORT ENGINEERING:** Layout of an airport with component parts and functions, Site selection for airport, Aircraft characteristics affecting the design and planning of airport, Airport classification, Runway orientation using wind rose with examples.

**RUNWAY-**Basic runway length-Corrections and examples, Runway geometrics, Taxiway-Factors affecting the layout - geometrics of taxiway-Comparison between Runway and Highway, Design of exit taxiway with examples.

***Problems on Runway orientation, Basic Runway length, Exit taxiway design. (L2, L3)***

### Suggested Learning Resources

#### Books

1. S K Khanna and C E G Justo, "Highway Engineering", Nem Chand Bros, Roorkee.
2. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.
3. "A Text Book of Railway Engineering" by S C Saxena and S P Arora
4. "Airport Engineering" by S C Rangwala
5. "Airport Planning and Design" by Khanna Arora and Jain, Nem Chand Bros, Roorkee.
6. "Roads, Railways, Bridges, Tunnels and Harbour Dock Engineering by B L Gupta, Amit Gupta.
7. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual", Nem Chand Bros, Roorkee.

#### Web links and Video Lectures (e-Resources):

1. <https://nptel.ac.in/courses/105101087>
2. [https://onlinemanuals.txdot.gov/txdotmanuals/rdw/horizontal\\_alignment.htm#BGBHGEGC](https://onlinemanuals.txdot.gov/txdotmanuals/rdw/horizontal_alignment.htm#BGBHGEGC)
3. [www.civil.iitb.ac.in/tvm/1111\\_nptel/567\\_Grade/plain/plain.html](http://www.civil.iitb.ac.in/tvm/1111_nptel/567_Grade/plain/plain.html)
4. <https://www.pavementinteractive.org/>
5. <https://www.eng.auburn.edu/research/centers/ncat/research/other-publications.html>
6. <https://nptel.ac.in/courses/105/106/105106203/>
7. <https://nptel.ac.in/courses/105/101/105101008>
8. <https://nptel.ac.in/courses/105/104/105104098>
9. <https://www.classcentral.com/course/edx-intro-to-traffic-flow-modeling-andintelligenttransport-systems-12728>
10. <https://www.aai.aero/>
11. <https://www.faa.gov/>
12. <https://www.icao.int>

#### Course Outcomes

At the end of the course, the student will be able to:

1. Explain the basic principles of geometric design in the context of transportation engineering and planning.
2. Select the appropriate pavement materials for construction and design the pavement as per standard practices.
3. Conduct traffic studies and analyse traffic data for practical applications.
4. Identify the Components parts of Railway Track and design the suitable runway for an Airport.
5. Able to interpret the experimental results of highway materials based on laboratory tests and design the pavement as per IRC guidelines. After a successful

CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.

- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).

- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC. The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.

- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory

component of IPCC for **25 marks**.

### Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	BCV403	Title: Transportation Engineering						Faculty Name:	Bharathi B					
List of Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3	-	1	-	-	-	-	-	-	-	-	1		
CO-2	1	1	-	1	-	-	-	-	-	-	-	1		
CO-3	2	-	-	-	-	-	-	-	-	-	-	1		
CO-4	2	1	-	-	-	-	-	-	-	-	2	1		
CO-5	1											1		

**Note:** 3 = Strong Contribution    2 = Average Contribution    1 = Weak Contribution    - = No Contribution