Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-5 (B. Tech.)

Subject: Transportation Engineering – BETCV15316
Type of Course: Professional Core
Prerequisite: NIL

Rationale: The course covers key aspects such as highway planning, geometric design, pavement materials, traffic engineering, and maintenance strategies. It provides students with an understanding of modern construction techniques and quality control measures essential for building durable roads. Additionally, the study of traffic management systems and road safety ensures that engineers design highways that optimize mobility while minimizing accidents and congestion.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

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Course Content:

Sr. No.	Course Content	Hrs.	% Weightage
1	**Introduction to Transportation Engineering:** Importance and role of transportation in infrastructure development, Modes of transportation – Road, Rail, Air, and Water, Characteristics of different modes of transport, Transportation planning process, Sustainable transportation and emerging trends.	06	15
2	**Highway Planning and Geometric Design:** Highway development in India – NHAI, IRC guidelines, Road classification and highway alignment principles, Sight distances – stopping, overtaking, and intermediate, Cross-section elements, super-elevation, and road widening, Design of horizontal and vertical curves.	12	25
3	**Traffic Engineering and Management:** Traffic characteristics – road users, vehicle, and flow behavior, Traffic studies – volume, speed, delay, and origin-destination studies, Traffic control devices – signs, signals, markings, and islands, Parking studies and accident analysis, Intelligent Transport Systems (ITS) and smart mobility solutions.	12	25
4	**Railway and Airport Engineering:** Railway track components – sleepers, rails, ballast, and fastenings, Geometric design of railway tracks – curves, gradients, and super elevation, Airport planning – site selection and runway configurations, Runway geometric design and taxiway planning, Airport drainage and terminal layout.	10	20
5	**Urban Transportation Systems and Planning:** Urban transportation problems and challenges, Public transportation systems – BRTS, Metro, and MRTS, Travel demand modeling and trip generation, Non-motorized transport and pedestrian facilities, Sustainable urban mobility solutions.	5	15

Continuous Assessment:

Sr. No.	Active Learning Activities	Marks
1	**Urban Transportation Flow Analysis on a Nearby Road:** Students (in group) will conduct a traffic volume and speed survey at a nearby at crowded road Network in Urban Area. They will analyze congestion patterns and propose possible traffic management solutions in urban area. Prepare the review report & upload in GMIU web portal.	10

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2	**Case Study on Urban Transportation Systems:** Faculty to guide the Students (in group) will research and compare public transport systems. They will present in PPT their findings and discuss challenges faced in Urban Transportation Systems & Upload on GMIU web portal.	10
3	**Hands-on Geometric Design Exercise:** Individual Student will design a road segment considering alignment, super-elevation, and sight distance. They will use field data to validate their design. Prepare the review report & upload in GMIU web portal.	10
TOTAL		**30**

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	20%	25%	20%	15%	10%	10%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand the fundamentals of transportation engineering and evaluate the characteristics of different transport modes.
CO2	Analyze highway planning and geometric design parameters based on IRC guidelines and practical field conditions.
CO3	Conduct traffic studies and suggest traffic management solutions to improve road safety and efficiency.
CO4	Explain the principles of railway and airport engineering including track geometry, runway design, and terminal planning.
CO5	Apply transportation planning principles to urban mobility systems, sustainable transport, and multimodal integration.

List of Practical

Sr. No.	Descriptions	Unit No.	Hrs.
01	Conduct a manual or automated traffic count to analyze hourly, daily, and peak traffic volumes.	01	04
02	Perform a journey time survey using moving car or floating car methods to evaluate speed and delays.	01	04
03	Analyze the traffic flow at an intersection and design its layout using IRC standards and HCM methods.	01	02

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04	Measure and design road cross-sections, horizontal and vertical alignments as per IRC guidelines.	02	04
05	Conduct laboratory tests on aggregates and bitumen for quality and suitability (e.g., impact test, ductility test).	02	02
06	Use a roughometer or other tools to measure and analyze the International Roughness Index (IRI) of a given road segment.	02	02
07	Analyze lane utilization using traffic flow data and propose improvements for effective lane usage.	03	02
08	Conduct a parking accumulation and turnover study to evaluate parking demand and capacity.	03	02
09	Design traffic signal timing plans based on traffic volume and flow analysis.	03	04
10	Record and classify vehicles passing a specific location based on their type, and analyze the traffic composition.	03	04
TOTAL			**30**

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] Highway Engineering by S.K. Khanna

[2] Transportation Engineering: An Introduction by C. Jotin Khisty

[3] Principles of Transportation Engineering by Parthasarathi S.