Program : **Diploma in Civil Engineering**	
Course Code : **5013**	Course Title: **Transportation Engineering**
Semester : **5**	Credits: **4**
Course Category: **Program Core**	
Periods per week: **4** (**L:3, T:1, P:0**)	Periods per semester: **60**

Course Objectives:

- To describe the types of roads as per IRC recommendations and to apply the principles of traffic engineering.
- To emphasize the importance of surveys, alignment and geometric features of Highways, bridges, Railways and tunnel.
- To impart the knowledge of geometric design of highways.
- To introduce concepts of material properties and construction methods of roads.
- To explain the components of railway and airport
- To enable students to distinguish between different modes of transportation and importance of bridges and tunnel.

Course Prerequisites:

Topic	Course code	Course Title	Semester
Knowledge of engineering construction materials		Building Construction & Construction Materials	3

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Summarize the components of various transportation systems and collection of traffic data.	13	Understanding
CO2	Identity the various material tests and construction methods of road.	15	Understanding
CO3	Illustrate the geometrical design features of roadways and railways	15	Applying

CO4	Outline the different modes of transportation and importance of bridge and tunnel	15	Understanding
	Series test	2	

CO-PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2				3			
CO3					3		
CO4					3		

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

On completion of the course, the student will be able to:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Summarize the components of various transportation methods and collection of traffic data**		
M1.01	Categorize the IRC classification of roads	3	Remembering
M1.02	Identify the factors to be considered for fixing road alignment	3	Understanding
M1.03	Compare different methods to collect traffic data	4	Understanding
M1.04	Illustrate various traffic management aids with sketches	3	Understanding

Contents:

Introduction to highway engineering and traffic engineering

Role of transportation in the development of nation - IRC - IRC classification of road - Major SH and NH in Kerala. - Road alignment - Factors to be considered in road alignment

Traffic Engineering: - Traffic volume study - Traffic intensity studies - OD studies - Road intersection studies - Intersections - types of at grade intersection - Channelizing islands - pedestrian loading islands - Rotary islands - Grade separated intersections - Clover leaf junction - Trumpet junction - Road markings - Traffic signs - Types and purpose of signs - Mandatory, cautionary, informatory and temporary signs.

CO2	Identity the various material tests and construction methods		
M2.01	Summarize highway geometric features	5	Understanding
M2.02	Illustrate cross section of a road and arboriculture	5	Understanding
M2.03	Explain types of road materials	4	Remembering
M2.04	Distinguish the construction of flexible and rigid pavement	1	Understanding
	Series Test -I	1	

Contents:

Highway Geometrics: Standards cross-sections of national highway in embankment and cutting- various components- Camber - Gradient - Design speed - Sight distance (SSD), road arboriculture- Road drainage

Curves: Necessity, types: Horizontal, vertical curves - Extra widening of roads - transition curve- Super elevation: Definition and formula

Types of road materials and their Tests - Test on aggregates - Types of Bitumen and its properties, Pavement - Definition, Types, Structural Components of pavement and their functions- Construction of Flexible pavement / Bituminous Road Emulsion, Cutback, Tar, Granular Sub Base (GSB), Wet Mix Macadam (WMM), Bituminous Macadam & Bituminous Concrete (BM & BC), Natural Rubber Modified Bitumen (NRMB). Use of shredded plastic - Rigid pavement, Cement concrete road - methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, White topping, merits and demerits of concrete roads.

CO3	Illustrate the geometrical design features of roadways and railways		
M3.01	Classify railway based on gauge	2	Remembering
M3.02	Illustrate the permanent way and its components	5	Applying
M3.03	Summarize railway geometric features and classify station yards	5	Understanding
M3.04	Summarize points and crossings, signals and interlocking	3	Applying

Contents:

Railway Engineering

Classification of Indian Railways, zones of Indian Railways - Permanent way: Ideal requirement, Components - Rail Gauge - Rail, Rail Joints - requirements, types - Creep of rail: causes and prevention - Sleepers, Ballast - functions and types - Rail fixtures and

fastenings - Railway Track Geometrics: Gradient, curves, grade compensation, super

elevation, cant deficiency, negative cant, coning of wheel, tilting of rail, Track Cross sections - standard cross section of single and double line in cutting and embankment

Points and crossings - Turn out - types, components, functions - Track junctions: crossovers, scissor cross over, diamond crossing, Track signals -principles of interlocking - Station yard: Classifications

Overview of Mono Rail and Metro rail

CO 4	**Outline the different modes of transportation and importance of bridge and tunnel**		
M4.01	Classify bridges and identify their components	4	Understanding
M4.02	Identify common tunnel shapes	3	Understanding
M4.03	Identify component parts of an airport	2	Understanding
M4.04	Demonstrate various runway alignment patterns	2	Understanding
	Series Test -II	1	

Contents:

Bridge, Tunnel, Airport and Harbour engineering

Bridge Engineering: Terminologies in bridge engineering - IRC classification - Bridge components - Foundation, Abutment, Pier, wing wall, deck slab, bridge bearing, girder beam and approach road.

Tunneling: Need for tunneling work, Terminologies in tunneling, Tunnel boring machine (TBM) common shapes of tunnels.

Airport Engineering:- airport components - Runway, Apron, taxi way, terminal building, hangers, cargo, Fueling facility, Fire fighting, parking and circulation area - layout of an airport, selection of site for airport

Docks and Harbours: - Definitions - classification and their functions - components of dock and harbour -Wharf, break waters - types - Layout.

Text / Reference:

T/R	**Book Title/Author**
T1	L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-82609-858) Edition 2018.
R2	Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee
R3	Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi

R4	Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication
R5	Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, Delhi
R_6	Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad

Online Resources:

Sl. No	Website Link
1	https://nptel.ac.in/courses/105101087/
2	http://www.thecivilengg.com/transportation_engineering.php
3	https://www.iitk.ac.in/ce/transportation-engineering
4	https://nptel.ac.in/courses/105/107/105107123/
5	https://www.mcgill.ca/civil/undergrad/areas/transportation