GOVERNMENT POLYTECHNIC, BOLANGIR
DEPARTMENT OF CIVIL ENGINEERING

Discipline: CIVIL ENGG.	**Semester: 3RD**	**Name of the Teaching Faculty: - Guest Faculty 2**
Subject: Transportation Engg.	**No. of days/week class allotted: 03**	**Total contact Hours-45Hrs** **Total Marks-100** **Assessment: Internal Assessment -30, End term-70**
COURSE OUTCOMES	COURSE OUTCOMES CO1: Identify different types of roads and highway systems as per IRC recommendations. CO2: Apply geometric design principles for highways as per IRC standards. CO3: Perform tests on road materials and explain the construction of different types of road pavements. CO4: Identify the components of railway tracks and explain their functions. CO5: Identify defects in railway tracks and explain track geometry, maintenance and railway station components.	

LESSON PLAN (45 CLASSES)

Class Day	Main Topic	Sub-Topics	Teaching Aids / Activities	Course Outcome
1	Introduction to Transportation Engineering	Role of transportation in national development	Transport network maps, case studies	CO1
2	Modes of Transportation	Roadways, railways, waterways and airways	Comparison charts	CO1
3	Merits and Demerits of Roadways and Railways	Comparative study	Discussion activity	CO1
4	Classification of Roads	National Highway, State Highway, MDR, ODR and Village Roads	IRC road classification charts	CO1
5	Road Alignment	Selection and factors affecting road alignment	Topographic maps, case studies	CO1
6	Introduction to	Importance and objectives	Highway	CO2

Class Day	Main Topic	Sub-Topics	Teaching Aids / Activities	Course Outcome
	Highway Geometric Design		photographs	
7	Camber	Definition, purpose and IRC recommendations	Road cross-section models	CO2
8	Types of Camber	Straight, parabolic and composite camber	Cross-sectional drawings	CO2
9	Kerbs and Road Margins	Kerbs, road margin, road formation and right of way	Highway cross-section diagrams	CO2
10	Design Speed	Definition and IRC recommendations	IRC tables and charts	CO2
11	Factors Affecting Design Speed	Terrain, traffic and road conditions	Case studies	CO2
12	Gradient	Definition and IRC recommended gradients	Highway profile drawings	CO2
13	Types of Gradient	Ruling, limiting, exceptional and minimum gradient	Numerical examples	CO2
14	Sight Distance	Definition and importance	Road safety photographs	CO2
15	Stopping Sight Distance (SSD)	IRC recommendations and numerical examples	Numerical exercises	CO2
16	Curves in Highways	Necessity and classification	Alignment drawings	CO2
17	Horizontal and Vertical Curves	Types and applications	Highway design sketches	CO2
18	Extra Widening	Concept and numerical examples	Numerical exercises	CO2
19	Super Elevation	Definition and significance	Road models	CO2

Class Day	Main Topic	Sub-Topics	Teaching Aids / Activities	Course Outcome
20	Design of Super Elevation	IRC formulae and numerical problems	Tutorial exercises	CO2
21	Standard Highway Cross Sections	National Highway in embankment and cutting	Cross-section drawings	CO2
22	Road Materials	Types and requirements of road materials	Aggregate and bitumen samples	CO3
23	Aggregate Tests	Flakiness and elongation index tests	Laboratory apparatus demonstration	CO3
24	Aggregate Tests	Angularity number test	Laboratory demonstration	CO3
25	Bitumen Tests	Penetration and ductility tests	Bitumen testing equipment	CO3
26	Bitumen Tests	Softening point, flash point and fire point tests	Laboratory apparatus	CO3
27	Pavements	Definition, types and components	Pavement models	CO3
28	Flexible and Rigid Pavements	Components and functions	Comparison charts	CO3
29	WBM Roads	Construction procedure	Construction photographs	CO3
30	WBM and WMM Roads	Merits and demerits	Case studies	CO3
31	Bituminous Roads	Types of bitumen and properties	Bitumen samples	CO3
32	Prime Coat, Tack Coat and Seal Coat	Purpose and applications	Site photographs	CO3
33	Bituminous Road Construction	Construction sequence	Process flow charts	CO3

Class Day	Main Topic	Sub-Topics	Teaching Aids / Activities	Course Outcome
34	Cement Concrete Roads	Methods of construction	Construction photographs	CO3
35	Concrete Road Joints	Types, fillers and sealants	Joint models	CO3
36	Indian Railways	Classification and railway zones	Railway network maps	CO4
37	Permanent Way	Components and ideal requirements	Railway track models	CO4
38	Rail Gauges	Types and selection criteria	Gauge models	CO4
39	Rails and Rail Joints	Requirements and types	Rail sections and joint models	CO4
40	Creep of Rails	Causes, effects and prevention	Case studies	CO4
41	Sleepers and Ballast	Types, functions and suitability	Sleeper and ballast samples	CO4
42	Rail Fixtures and Fastenings	Fish plates, spikes, bolts, keys and anchors	Actual railway fittings	CO4
43	Railway Track Geometry	Alignment, gradients, curves, super elevation and cant	Railway alignment drawings	CO5
44	Points, Crossings and Railway Stations	Turnouts, crossovers, station yards and marshalling yards	Railway layout diagrams	CO5
45	Track Maintenance and Inspection	Maintenance tools, duties of PWI, gangmate and keyman, defects in railway tracks, revision and assessment	Maintenance tools, case studies, quiz	CO5

LEARNING RESOURCES

1. Khanna, S.K., Justo, C.E.G. and Veeraragavan, A., Highway Engineering.
2. Kadiyali, L.R., Highway Engineering.
3. Saxena, S.C. and Arora, S.P., Railway Engineering.
4. Satish Chandra and Agarwal, M.M., Railway Engineering.
5. IRC Specifications and Guidelines.
6. Indian Railways Permanent Way Manual.
7. MoRTH Specifications for Road and Bridge Works.

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