

MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

LESSON PLAN							
Department of _____ Civil _____ Engineering							
Name of the Subject	HIGHWAY ENGINEERING			Name of the handling Faculty	Mrs.S.Hemavathi		
Subject Code	CE8604			Year / Sem	VI/III		
Acad Year	2021-2022			Batch	2019 - 2023		
Course Objective							
To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods							
Course Outcome							
• Explain the importance of planning and aligning of highway.							
• Explain the Geometric design of highways							
• Explain Design flexible and rigid pavements							
•Discuss about the Highway construction materials, properties, testing methods							
• Discuss the importance of pavement management system, evaluation of distress and maintenance of pavements.							
Lesson Plan							
Sl. No.	Topic(s)	T / R*	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO
		Book					
UNIT I HIGHWAY PLANNING AND ALIGNMENT							
1	Significance of highway planning	T1 ,T2	1	BB,PPT	L2	CO1	PO1-PO2
2	Modal limitations towards sustainability	T1	1	PPT	L1	CO1	PO1-PO2
3	History of road development in India	T1	1	PPT	L1	CO1	PO1,PO2
4	factors influencing highway alignment	T2	1	BB,PPT	L2	CO1	PO1,PO2
5	procedure for evaluating damaged structure	T1	1	BB,PPT	L2	CO2	PO1,PO2
6	Soil suitability analysis - Road ecology	T1	1	BB,PPT	L1	CO1	PO1,PO2
7	Engineering surveys for alignment, objectives, conventional and modern methods	T1	1	BB,PPT	L1	CO1	PO1,PO2
8	Classification of highways	T1	1	BB,PPT	L1	CO1	PO1,PO2
9	Locations and functions – Typical cross sections of Urban and Rural roads	T1,T2	1	PPT	L2	CO2	PO1,PO2
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any Quiz							
Evaluation method - MCQ							
UNIT II GEOMETRIC DESIGN OF HIGHWAYS							
10	Cross sectional elements - Sight distances	T1	2	BB,PPT	L2	CO2	PO1-PO3
11	Horizontal curves, Super elevation, transition curves, widening at curves	T1	2	PPT	L2	CO2	PO1,PO2
12	Vertical curves	T1	1	BB,PPT	L2	CO2	PO1,PO2

13	Gradients, Special consideration for hill roads	T1	2	BB,PPT	L1	CO2	PO1,PO2
14	Hairpin bends	T1	1	BB,PPT	L1	CO2	PO1,PO2
15	Lateral and vertical clearance at underpasses.	T1	1	BB,PPT	L2	CO2	PO1,PO2

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
Assignment on Quality assurance

Evaluation method - Paper Based

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS

16	Pavement components and their role	T1	1	BB,PPT	L2	CO3	PO1,PO2
17	Design principles	T1	2	PPT	L2	CO3	PO1,PO2
18	Design practice for flexible and rigid Pavements (IRC methods only)	T1	2	PPT	L1	CO3	PO1,PO2
19	Embankments	T1	2	PPT	L1	CO3	PO1,PO2
20	Problems in Flexible pavement design	T1	2	PPT	L2	CO3	PO1,PO2

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
Tutorial - Describe special concretes

Evaluation method - Paper Based

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE

21	Highway construction materials, properties, testing methods	T1	2	PPT	L1	CO4	PO1-PO3,PO5
22	CBR Test for subgrade	T1	1	BB,PPT	L2	CO4	PO1-PO3,PO5
23	tests on aggregate & bitumen	T1	1	BB,PPT	L1	CO4	PO1-PO3,PO5
24	Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials	T1	2	PPT	L2	CO4	PO1-PO3,PO5
25	Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included)	T1	1	PPT	L2	CO4	PO1-PO3,PO5
26	Quality control measures - Highway drainage — Construction mach	T1	2	PPT	L2	CO4	PO1-PO3,PO5

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
Quiz

Evaluation method - MCQ

UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS

23	Pavement distress in flexible and rigid pavements	T1	2	BB,PPT	L1	CO5	PO1-PO3
24	Types of maintenance	T2	2	BB,PPT	L1	CO5	PO1-PO3
25	Pavement Management Systems	T2	2	PPT	L1	CO5	PO1-PO3
26	Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements	T2	1	PPT	L2	CO5	PO1-PO3
27	Strengthening of pavements –Highway Project formulation.	T2	2	BB,PPT	L2	CO5	PO1-PO3

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any
Study

Case

Evaluation method - Report Based														
Content Beyond the Syllabus Planned														
1	Reason and measures for failure of ordinary Rigid pavement													
Text Books														
1	Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014.													
2	Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010													
3	Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.													
Reference Books														
1	Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC: 37-2012													
2	Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2012													
3	Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2012													
4	Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, 1st Edition, USA, 2011													
5	Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011													
6	Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010													
7	O'Flaherty.C.A "Highways, Butterworth – Heinemann, Oxford, 2006													
8	IRC-37–2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi													
9	IRC 58-2012. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, New Delhi													
Website / URL References														
1	http://www.digimat.in/nptel/courses/video/105105107/L10.html													
2	https://www.digimat.in/nptel/courses/video/105107123/L24.html													
Blooms Level														
Level 1 (L1) : Remembering			Lower Order Thinkin g	Fixed Hour Exam s	Level 4 (L4) : Analysing				Higher Order Thinking	Projects / Mini Projects				
Level 2 (L2) : Understanding					Level 5 (L5) : Evaluating									
Level 3 (L3) : Applying					Level 6 (L6) : Creating									
Mapping syllabus with Bloom’s Taxonomy LOT and HOT														
Unit No	Unit Name			L1	L2	L3	L4	L5	L6	LOT	HOT	Total		
Unit 1	HIGHWAY PLANNING AND ALIGNMENT			5	4	0	0	0	0	9	0	9		
Unit 2	GEOMETRIC DESIGN OF HIGHWAYS			2	4	0	0	0	0	6	0	6		
Unit 3	DESIGN OF FLEXIBLE AND RIGID PAVEMENTS			2	3	0	0	0	0	5	0	5		
Unit 4	HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE			2	4	0	0	0	0	6	0	6		
Unit 5	EVALUATION AND MAINTENANCE OF PAVEMENTS			3	2	0	0	0	0	5	0	5		
Total				14	17	0	0	0	0	31	0	31		
Total Percentage				45.16	54.8387	0	0	0	0	100	0	100		
CO PO Mapping														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												2
CO2	3	2	2											2
CO3	3	3												2
CO4	3	2			3									2
CO5	3	2	3											2
Avg	3	2.2	2.5		3									2
Justification for CO-PO mapping														

CO1	PO1-PO2:Significance of highway planning – Modal limitations towards sustainability - History of road development in India – factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods -Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads				
CO2	PO1-PO3: Cross sectional elements - Sight distances, PO1-PO2:Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.				
CO3	PO1-PO2: Pavement components and their role - Design principles -Design practice for flexible and rigid Pavements (IRC methods only) – Embankments- Problems in Flexible pavement design.				
CO4	PO1-PO3,PO5: Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) – Quality control measures - Highway drainage — Construction machineries				
CO5	PO1-PO3 : Pavement distress in flexible and rigid pavements – Types of maintenance – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Highway Project formulation.				
3	High level	2	Moderate level	1	Low level

Name & Sign of Faculty Incharge : Hemavathi.S

Name & Sign of Subject Expert :

Head of the Department :