
	SRI VIDYA COLLEGE OF ENGINEERING & TECHNOLOGY COURSE PLAN (THEORY)	
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ACADEMIC YEAR: 2018 -2019 ODD

Subject Code	CE6504	L	P	T	C
Subject Title	HIGHWAY ENGINEERING	3	0	0	3
Year / Dept / Sem	III / CIVIL / V	Regulation Year	2013		
Faculty Name / Desg / Dept	Mr. J. SEYON RAJA., M.E.,/ASSISTANT PROFESSOR/CIVIL				
Course Prerequisite	<div>1. The students should have the knowledge of reconnaissance survey.</div> <div>2. Basic knowledge about road construction.</div> <div>3. The students must have more knowledge about quality control tests on road making materials.</div>				

CE6504**HIGHWAY ENGINEERING****L T P C**
3 0 0 3**OBJECTIVES:**

- ☐ 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.

UNIT I HIGHWAY PLANNING AND ALIGNMENT**8**

Significance of highway planning – Modal limitations towards sustainability - History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods. -

UNIT II GEOMETRIC DESIGN OF HIGHWAYS**12**

Typical cross sections of Urban and Rural roads — Cross sectional elements - Sight distances – 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.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS**9**

Design principles – pavement components and their role - Design practice for flexible and rigid Pavements (IRC methods only) - Embankments .

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE**8**

Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – 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.

UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS**8**

Pavement distress in flexible and rigid pavements – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Types of maintenance – Highway Project formulation.

TOTAL: 45 PERIODS**OUTCOMES:**

- The students completing this course would have acquired knowledge on planning, design, construction and maintenance of highways as per IRC standards and other methods.

TEXTBOOKS:

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. Indian Road Congress (IRC), Guidelines and Special Publications of Planning and Design.

REFERENCES:

1. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.
2. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Ninth Impression, South Asia, 2012
3. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, 1st Edition, USA, 2011
4. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011
5. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010

O'Flaherty.C.A "Highways, Butterworth – Heinemann, Oxford, 2006

Course Objectives (CO)	<p>CO1: The objective of the course is to educate the students on the various components of highway engineering.</p> <p>CO2: It exposes the students to highway planning, engineering surveys for highway alignment.</p> <p>CO3: Design of geometric elements of highways and urban roads, rigid and flexible pavements</p> <p>CO4: The students further learn the desirable properties of highway materials and various practices adopted for construction.</p> <p>CO5: This course enables the students to develop skill one valuation of the pavements and to decide appropriate types of maintenance.</p>
Expected Course Outcomes (ECO)	<p>At the end of the course, the students should be able to:</p> <p>ECO1: Have acquired knowledge on planning, design, construction and maintenance of highways as per IRC standards and other methods.</p> <p>ECO2: Then student will able to underlying highway design.</p> <p>ECO3: The student will able to access alternative pavement designs and</p>

	<p>understand their deterioration.</p> <p>ECO4: The student will make a specification</p> <p>ECO5: The valuation of the road will be done by the student.</p>
<p style="text-align: center;">PROGRAM OUTCOMES (Pos)</p> <p>Engineering graduates will be able to:</p> <ol style="list-style-type: none"> 1. ENGINEERING KNOWLEDGE: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. 2. PROBLEM ANALYSIS: identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principals of mathematics, natural sciences and engineering sciences. 3. DESIGN/ DEVELOPMENT OF SOLUTIONS: Design solutions for complex engineering problems and design systems components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural societal, and environmental considerations. 4. CONDUCT INVESTIGATIONS COMPLEX PROBLEMS: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions. 5. MODERN TOOL USAGE: Create, select, and apply appropriate techniques resources, and modern engineering and it tools including production and modeling to complex engineering activities with an understanding of the limitations. 6. THE ENGINEERING AND SOCIETY: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices. 7. ENVIRONMENT AND SUSTAINABILITY: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. 8. ETHICS: Apply ethical principles and commit to professional and responsibilities and norms of the engineering practices. 9. INDIVIDUAL AND TEAM WORK: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary setting. 10. COMMUNICATION: Communicate effectively on complex engineering activities with the engineering community and with society at large such as being able to comprehend and write effectives reports and design documentations, make presentations, and give and receive clear instructions. 11. PROJECT MANGMENT AND FINANCE: Demonstrate knowledge and understanding of the engineering and management principals and apply these to ones own work as a member and leader in a team to manage project and in multidisciplinary environments. 12. LIFE LONG LEARNING: Recognize the need for, and have the preparations and ability to engage in independent and lifelong learning in the broadest context of technological change. 	

Mapping of CO & PO(Specify the PO's)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	-	-	-	-	-	-	-	2	2
CO2	-	-	-	-	-	-	3	-	3	2	-	-
CO3	-	-	3	-	-	2	-	-	-	-	-	-
CO4	-	-	-	-	-	-	2	-	2	-	-	-
CO5	-	-	2	-	2	-	-	-	-	-	-	-
1 – Slight 2 –Moderate 3 – High												
Bridging the Curriculum Gap (Additional Topics beyond syllabus/ Seminars/ Assignments)				BCG1: Problems in highway valley curve BCG2: Estimating of road bridges. BCG3: Traffic maintenance								
Related Website URLs				W1: http://www.tnhighways.gov.in/pdf/PWD%20SOR-2016-17.pdf W2: http://www.tnpsc.gov.in/tender/tender_act.pdf W3: http://nptel.ac.in/courses/105103093/14								
Related Video Course Materials				V1: https://www.youtube.com/watch?v=D04uxZpgp6M V2: https://www.youtube.com/watch?v=RvDO4KCmHRQ V3: https://www.youtube.com/watch?v=9jp2HC4-KMA								

S. No	Topic	Reference Book with Page Nos.	Mode Of Delivery	No. of Periods	Cumulative No. of Periods
UNIT – I: HIGHWAY PLANNING AND ALIGNMENT					
1.	Significance of highway planning	T1	Class room teaching	1	1
2.	Modal limitations towards sustainability	T1	Class room teaching	1	2
3.	History of road development in India	T1	Class room teaching	1	3
4.	Classification of highways, Locations and functions	T1	Class room teaching, PPT	1	4
5.	Factors influencing highway alignment	T1	Class room teaching, PPT	1	5
6.	Soil suitability analysis, Road ecology	T1	Class room teaching	1	6
7.	Engineering surveys for alignment	T1	Class room teaching	1	7
8.	objectives conventional and modern methods	T1	Class room teaching	1	8

UNIT II: GEOMETRIC DESIGN OF HIGHWAYS 8					
1	Typical cross sections of Urban and Rural roads	T1	Class room teaching	1	9
2	Cross sectional elements	T1	Class room teaching	2	11
3	Sight distances	T1	Class room teaching, PPT	2	13
4	Horizontal curves, Super elevation, transition curves, widening at curves	T1	Class room teaching, PPT	2	15
5	Vertical curves	T1	Class room teaching	1	16
6	Gradients, Special consideration for hill roads	T1	Class room teaching	2	18
7	Hairpin bends	T1	Class room teaching	1	19
8	Lateral and vertical clearance at underpasses	T1	Class room teaching	1	20
UNIT III: DESIGN OF FLEXIBLE AND RIGID PAVEMENTS					
1	Design principles	T1	Class room teaching	2	22
2	pavement components and their role	T1	Class room teaching	2	24
3	Design practice for flexible and rigid Pavements (IRC methods)	T1	Class room teaching	4	28
4	Embankments	T1	Class room teaching	1	29
UNIT IV: HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE					
1	Highway construction materials, properties, testing methods	T1	Class room teaching	1	30
2	CBR Test for subgrade	T1	Class room teaching, PPT	1	31
3	tests on aggregate & bitumen	T1	Class room teaching, PPT	1	32
4	Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials	T1	Class room teaching, PPT	1	33
5	Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included)	T1	Class room teaching	1	34
6	Quality control measures	T1	Class room teaching	1	35

7	Highway drainage	T1	Class room teaching, PPT	1	36
8	Construction machineries	T1	Class room teaching, PPT	1	37
UNIT V: EVALUATION AND MAINTENANCE OF PAVEMENTS					
1	Pavement distress in flexible and rigid pavements	T1	Class room teaching	2	39
2	Pavement Management Systems	T1	Class room teaching	1	40
3	Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements	T1	Class room teaching	2	42
4	Strengthening of pavements	T1	Class room teaching	1	43
5	Types of maintenance	T1	Class room teaching	1	44
6	Highway Project formulation	T1	Class room teaching	1	45

	<i>Prepared by</i>	<i>Approved by</i>
Name	Mr. J. SEYON RAJA	Mr. P. SURESH KUMAR
Designation	Assistant Professor / CIVIL	Professor & HOD (Dept)
Sign with date		

LEGEND:**METHODOLOGY TO MAP OBJECTIVE WITH OUTCOME**

Course outcomes are achieved through

- a.** Suitable Analogies.
- b.** Class room teaching.
- c.** Assignments.
- d.** Tutorials
- e.** Weekly, monthly and model exams.
- f.** Brain storming.
- g.** Group discussion and role play.
- h.** Seminars