

B.E. Semester: IV
Civil Engineering
Subject Name: HIGHWAY ENGINEERING (CV404)

A. Course Objective:

- To provide a coherent development to the students for the courses in sector of Engineering like Transportation & Traffic Engineering etc.
- To present the foundations of many basic Engineering tools and concepts related Highway Engineering.
- To give an experience in the implementation of Engineering concepts which are applied in field of Transportation Engineering
- To involve the application of scientific and technological principles of planning, analysis, design and management to highway engineering.

B. Teaching /Examination Scheme

Teaching scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract/ Tut.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
03	00	02	05	04	03	70	30	20	30	150

C. Detailed Syllabus:

1 Highway Introduction, Planning & Development

Highway planning in India, Development, Rural and urban roads, Road departments in India, Road classification, Road authorities i.e. IRC, CRRI, NHAI, NHDP etc

2 Highway Alignment & Surveys:

Reconnaissance, Aerial surveys, Location surveys, Location of bridges, Problems in rural and urban areas. Highway drawings & reports Highway project preparation

3 Highway Geometric Design

Topography and physical features, Cross section elements like carriageway width, formation width, right of way, etc., friction, Light reflecting characteristics, roughness, camber, sight distances, horizontal alignment, design speed, minimum radius, super-elevation, transition curve, gradients, design of summit and valley curves.

4 Highway Construction Materials

Aggregates and their types, physical and engineering properties, Fillers, Bitumen, Characteristics, Emulsions and cutbacks, Basic tests on all materials.

5 Highway Construction

Construction of various types of roads, Joints in cement concrete pavements, Road side development: Arboriculture, street lighting.

6 Design of Highway Pavements

Design of flexible (G.I. method and CBR method using million standard axles) and rigid pavements (Fatigue concept of pavement design), Maintenance of pavements

7 Highway Drainage & Maintenance

Importance of highway drainage, Pavement failures, strengthening of existing pavements, Surface and sub-surface drainage arrangements, sketches and design

8 Highway Economics & Finance

Financing of road projects, administration of roads, PPP models, Road safety audit, Methods of economic evaluation of highway projects

9 Traffic Engineering

Road user characteristics, vehicular characteristics, traffic flow characteristics, speed, traffic volume studies, parking studies - definition, purpose, types, survey methods. Accident studies - purpose, types, causes, collision diagram, condition diagram, preventive measures. Traffic control devices like pavement marking, signs, signals. Traffic management, various types of intersection and their design concept.

D. Lesson Planning

Sr. No.	Title of the Unit	Minimum Hours	Weightage
1.	Highway Introduction, Planning & Development	3	5
2.	Highway Alignment & Surveys	4	10
3.	Highway Geometric Design	8	20
4.	Highway Construction Materials	2	5
5.	Highway Construction	4	10

6.	Design of Highway Pavements	7	15
7.	Highway Drainage & Maintenance	5	10
8	Highway Economics & Finance	5	10
9	Traffic Engineering	7	15

E. List of Experiments:

Experiment No.	Name of Experiment
Test on Aggregates	
1	Aggregate Crushing Test
2	Aggregate Impact Test
3	Los Angeles Abrasion Test
4	Shape Tests
5	Specific Gravity , Water Absorption Test and Bulk Density
Test on Bitumen	
6	Penetration Test
7	Ductility Test
8	Flash & Fire Point Test
9	Softening Point Test
10	Specific Gravity Test
11	Viscosity Test
Test on mix design	
12	Marshal Stability Test
Test on Subgrade soil	
13	California Bearing Ratio Test

F. Instructional method and pedagogy (Continuous Internal Assessment Scheme) (CIA)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and practical which carries marks.

- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms Carries Marks
- Internal exam of 30 marks will be conducted as a part of Mid semester evaluation.
- Experiments shall be performed in the field related to course contents.
- The course includes a practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

G. Students Learning Outcomes:

- The students will gain an experience in the implementation of Transportation Engineering on engineering concepts which are applied in field Highway Engineering.
- The students will get a diverse knowledge of highway engineering practices applied to real life problems.
- The students will learn to understand the theoretical and practical aspects of highway engineering along with the design and management applications.

H. Recommended Study Materials

A. Reference Books:

1. Khanna, S.K. & Justo, C.E.G., Highway Engineering, NemChand & Bros, Roorkee (U.A).
2. Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.
3. Kadiyali, L.R. & Lal, N.B., Principles & Practices of Highway Engineering, Khanna Publishers, New Delhi.
4. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand & Co., New Delhi.
5. IRC – 37 “Guidelines for Design of flexible Pavements”, IRC, New Delhi, 2001.
6. IRC – 67 “Code of Practice for Road Signs”, IRC, New Delhi – 2001. 30
7. IRC: 58, 2002: “Guidelines for the Design of Plain Jointed Rigid Pavements for Highways”, IRC, N. Delhi, December, 2002.
8. IRC:70, 1977: “Guidelines on Regulation and Control of Mixed Traffic in Urban Areas”
9. IRC:106, 1990: “Guidelines for Capacity of Urban Roads in Plain Areas”
10. IRC-73
11. IRC-12

B. Web Materials:

1. <http://www.cdeep.iitb.ac.in/nptel>
2. <http://www.nptel.iitm.ac.in>