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|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Branch Name:</b>   | Civil Engineering                                                                                                                                                                               |
| <b>Semester/Year:</b> | Semester V / Third Year                                                                                                                                                                         |
| <b>Subject Title:</b> | Highway Engineering                                                                                                                                                                             |
| <b>Subject Code:</b>  | 1ET1060505                                                                                                                                                                                      |
| <b>Pre-requisite:</b> | Know about highway planning and its classification, geometric design highway, bituminous materials, flexible and rigid pavement, pavement failures, survey of traffic, traffic control devices. |

**Course Objective:**

- Planning, design, construction, operation, and maintenance of Highway.
- To learn about safe and effective transportation of people and goods.
- To study the future traffic flows, design of highway intersections/interchanges, geometric alignment and design, highway pavement materials.

| Teaching Scheme<br>(Hours per week) |                 |                  |        | Evaluation Scheme (Marks) |                          |                          |                          |                  |
|-------------------------------------|-----------------|------------------|--------|---------------------------|--------------------------|--------------------------|--------------------------|------------------|
| Lecture<br>(L)                      | Tutorial<br>(T) | Practical<br>(P) | Credit | Theory (Marks)            |                          | Practical (Marks)        |                          | Total<br>(Marks) |
|                                     |                 |                  |        | University<br>Assessment  | Continuous<br>Assessment | University<br>Assessment | Continuous<br>Assessment |                  |
| 03                                  | 00              | 02               | 04     | 70                        | 30                       | 30                       | 20                       | 150              |

| Subject Contents |                                                                                                                                                                                                                                                                     |                |                  |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------|
| Sr.<br>No        | Topic                                                                                                                                                                                                                                                               | Total<br>Hours | Weightage<br>(%) |
| 1                | <b><u>Unit – I</u></b><br>Scope of highway engineering, Highway planning and development in India, Classification of rural and urban roads, Road patterns, Planning and alignment surveys.                                                                          | 04             | 10               |
| 2                | <b><u>Unit – II</u></b><br>Highway geometric design: Cross sectional elements – width, surface, camber, Sight distances – SSD, OSD, ISD, HSD, Design of horizontal and vertical alignment – curves, super-elevation, widening, gradients, summit and valley curves. | 09             | 22               |
| 3                | <b><u>Unit – III</u></b><br>Highway materials: subgrade soil, aggregates, binder materials, bituminous materials, bituminous paving mixes, cement and cement concrete –their engineering and physical properties, basic tests.                                      | 07             | 16               |
| 4                | <b><u>Unit – IV</u></b><br>Pavement design factors, Design of flexible (GI and CBR method) and rigid pavements (fatigue concept), Construction of earthen, Gravel, WBM, Bituminous, Cement concrete, RCC and Pre-stressed concrete roads, Soil stabilized roads     | 07             | 16               |
| 5                | <b><u>Unit – V</u></b><br>Pavement failures, Maintenance, Surface and sub-surface drainage, Hillroads – alignment, construction, drainage and maintenance. Road side                                                                                                | 07             | 16               |

|   |                                                                                                                                                                                                                                                                                                                              |    |    |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
|   | development – arboriculture, street lighting. Highway administration, economics and finance, road safety audit                                                                                                                                                                                                               |    |    |
| 6 | <b><u>Unit – VI</u></b><br>Traffic engineering: basic elements, road users - vehicles - traffic flow characteristics, speed – volume studies, surveys, parking studies, Accident studies: causes, collision and condition diagrams, preventive measures, Traffic control: markings, signs, signals, intersections, rotaries. | 08 | 20 |

### Course Outcome:

After learning the course the students should be able to:

- Know about highway planning and its classification.
- Carryout geometric design of highway.
- Carryout laboratory tests on aggregates and bituminous materials.
- Carryout preliminary design of flexible and rigid pavement.
- Know about pavement failures, its maintenance, importance of drainage, hill roads and their challenges.
- Carryout survey of classified traffic volume count and spot speed study on highway.
- Know about importance and working of different traffic control devices.

### List of Reference Books:

1. Dr. S.K. Khanna and Dr. C.E. G. Justo, “Highway Engineering”, Nem Chand & Bros., Roorkee
2. L.R. Kadiyali, “Highway Engineering”, Khanna Publishers, New Delhi.
3. L.R. Kadiyali, “Traffic Engineering and Transport Planning,” Khanna Publishers, New Delhi.
4. S.K. Sharma, “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.
7. IRC: 58, 2002: “Guidelines for the Design of Plain Jointed Rigid Pavements for Highways”, IRC, N. Delhi, December, 2002.

### List of Experiments:

1. Introduction to Highway Engineering Laboratory Equipment.
2. California Bearing Ratio (CBR) Test.
3. Aggregate crushing Test
4. Aggregate Impact Test.
5. Flakiness Index and Elongation Index Test for Aggregate.
6. Los Angeles Abrasion Test / Deval Abrasion Test
7. Marshall stability test on Bitumen mix.
8. Specific gravity and Water Absorption test for Aggregate.
9. Penetration test for Bitumen.
10. Softening point test for Bitumen.
11. Ductility test for Bitumen.
12. Flash and Fire Point test for Bitumen.
13. Specific gravity test for Bitumen
14. Viscosity Test for Bitumen.

### E-Resources :

1. <http://nptel.ac.in/>