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|-----------------------------|--------------------------------------------------------------|
| <b>Branch Name:</b>         | Transportation Engineering                                   |
| <b>ProgramCode:</b>         | ET211                                                        |
| <b>CourseName:</b>          | Transportation Facility Design                               |
| <b>CourseCode:</b>          | 2ET2110401T                                                  |
| <b>Pre-requisiteCourse:</b> | Urban Transportation System Planning and Traffic Engineering |

**Course Objective:**

1. To describe various methods of transportation facilities of different types of intersections, terminals, roadways and their components, specifications and tests thereof.
2. To analyze factors affecting for the facility given in details, information and data set and able to present frameworks for mechanistic-empirical design methods for transportation facilities required for the users.
3. To assess the problems / causes of failures in highway, terminals, pedestrian facilities in specific conditions and suggest preventive measures thereof.

| Credit | Teaching Scheme |   |   |       | Evaluation Scheme (Marks) |      |      |      |                   |      |      |      |               |
|--------|-----------------|---|---|-------|---------------------------|------|------|------|-------------------|------|------|------|---------------|
|        | Hours per week  |   |   |       | Theory (Marks)            |      |      |      | Practical (Marks) |      |      |      | Total (Marks) |
|        | L               | T | P | Total | SEE                       |      | CCA  |      | SEE               |      | CCA  |      |               |
|        |                 |   |   |       | Min.                      | Max. | Min. | Max. | Min.              | Max. | Min. | Max. |               |
| 5      | 3               | 2 | - | 5     | 24                        | 60   | 16   | 40   | -                 | -    | -    | -    | 100           |

| Sr. No. | Topics                                                                                                                                                                                                                                                                                                                                               | Teaching Hrs. | Module Weightage |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|
| 1       | Introduction: Design of highways, design of at-grade intersections, design of signalized intersection, design of grade separated intersection, terminal design, and design of facilities for non-motorised transport.                                                                                                                                | 8             | 10%              |
| 2       | Terminal Planning & Design: Terminal functions, analysis of terminals, process flow charts of passenger & goods terminals, terminal processing time, waiting time, capacity & level of service concept, study of typical facilities of highway, railway, airport and waterway terminals, concept of inland port.                                     | 10            | 10%              |
| 3       | Design of Highways: Hierarchy of highway system, functions, design designations, concepts in horizontal & vertical alignment, integration, optical design, geometrical standards for mobility & accessibility components, cycle track design, bridge architect, landscaping and safety considerations, evaluation and design of existing geometrics. | 10            | 20%              |
| 4       | Design of Intersections: Review of design of at-grade intersections, signal coordination- graphic methods & computer techniques, grade separated intersections- warrants for selection, different types & geometric standards, spacing & space controls, ramps & gore area design.                                                                   | 10            | 20%              |

|   |                                                                                                                                         |   |     |
|---|-----------------------------------------------------------------------------------------------------------------------------------------|---|-----|
| 5 | Pedestrian Facility Design: Footpath, Zebra crossings, Foot over bridge, Under pass, Pedestrian precincts, Pedestrian actuated signals. | 7 | 20% |
|---|-----------------------------------------------------------------------------------------------------------------------------------------|---|-----|

#### References:

1. Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna publishers.
2. Salter, R J., Highway Traffic Analysis and Design, ELBS.
3. Edward K. Morlock, Introduction to Transportation Engineering & Planning, International Student Edition, Mc-Graw Hill Book Company, New York.
4. Khanna S.K., Arora M.G., Jain S.S., Airport Planning & Design, Nemchand Bros., Roorkee.
5. Horenjeff Robert, The planning & Design of Airports, McGraw Hill Book Co.
6. Saxena S.C., Railway Engineering, Dhanpat Rai & Sons, 1995.
7. Vukan R. Vuchic, Urban Transit : Operations, Planning and Economics, Wiley Sons Publishers.
8. Bindra S.P., Docks & Harbour Engineering, Dhanpat Rai Publications.
9. Srinivasan R., Harbours, Docks & Tunnel Engineering, Charotar Publishing House, Anand, 1999.
10. IRC-SP41-1994: Guidelines for the Design of At-Grade Intersections in Rural & Urban Areas.
11. IRC-73-1980: Geometric Design for Rural Highways.
12. IRC-86-1983: Geometric Design Standards for Urban Roads in Plains.
13. IRC-38-1988: Guidelines for Design of horizontal curves for Highway and design tables.
14. IRC-103-2012: Guidelines for Pedestrian Facilities (First Revision).
15. IRC-11-2015: Recommended Practice for the Design and Layout of Cycle Tracks (First Revision).

#### Course Learning Outcomes:

1. Design of at-grade intersections, signalized intersection, grade separated intersection.
2. Explain pedestrian facility design.
3. Describe geometrical standards for mobility & accessibility components.

#### List of Practicals:

The practical may include study of existing traffic facility which includes various surveys, Data Collection for design, Study of various codes of practice and implementation. The students will work in group for the design work based on syllabus such as

1. Design of at-grade intersections, signalized intersection and/or grade separated intersections.
2. Design of facilities required for non-motorised transport and pedestrians.
3. Design of terminals for passenger and goods on highway, railway, and airport and waterway port.
4. Design of horizontal and vertical alignment of highways with landscaping and safety aspects.

#### List of Open Source Software/learning website:

<https://nptel.ac.in/courses/105101087/>  
<https://nptel.ac.in/courses/105101008/>  
<https://nptel.ac.in/courses/105101008/47>

<https://nptel.ac.in/courses/105104098/>  
<https://freevideolectures.com/subject/civil-engineering/>  
<https://freevideolectures.com/course/2673/transportation-engineering-ii>

### Course Learning Outcomes (CLO):

After successful completion of the course the students shall be able to:

| CLO  | Description                                                                              | Bloom's Taxonomy Level  |
|------|------------------------------------------------------------------------------------------|-------------------------|
| CLO1 | Design of at-grade intersections, signalized intersection, grade separated intersection. | L-2, L-3, L-4, L-5      |
| CLO2 | Explain pedestrian facility design.                                                      | L-2, L-3, L-4, L-5, L-6 |
| CLO3 | Describe geometrical standards for mobility & accessibility components.                  | L-1, L-2, L-3           |

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

### Mapping of CLOs with Pos & PSOs

|                                            | Program Outcomes (POs) |     |     |     |     |     |     |     |     |      |      |      | Program Specific Outcomes (PSOs) |      |      |
|--------------------------------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
| Cours<br>e<br>Learn<br>ing<br>Outco<br>mes | PO1                    | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1                             | PSO2 | PSO3 |
| CLO1                                       | M                      |     | H   |     | M   | M   |     | L   |     | M    |      | M    | M                                | H    | M    |
| CLO2                                       | H                      | M   |     | M   |     | M   |     |     | M   |      |      | M    | M                                | M    | L    |
| CLO3                                       |                        | M   | H   |     | M   |     | M   |     |     | L    |      | M    | M                                | M    | M    |

H: High, M: Medium, L: Low