

### 3/4 B.Tech. FIFTH SEMESTER

CE5T5

TRANSPORTATION ENGINEERING – I

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

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#### Objectives:

- To know about highway planning, alignment and route selection
- To design the geometric elements of highways and highway pavements
- To study about highway materials and construction procedure of various types of pavements

#### Learning outcomes:

At the end of course the student will be able to:

- Understand the highway development and planning in India,
- Take up geometric design, traffic studies and traffic regulation.
- Understand the utilization of materials and different types of construction on Highway.
- Design flexible pavements and rigid pavements

#### UNIT I

##### HIGHWAY DEVELOPMENT AND PLANNING:

Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Planning Surveys-Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

#### UNIT – II

##### HIGHWAY GEOMETRIC DESIGN:

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment- Gradients- Vertical curves.

#### UNIT – III

##### TRAFFIC ENGINEERING AND MANAGEMENT:

Basic Parameters of Traffic- Volume, Speed and Density- Traffic Volume Studies- Data Collection and Presentation- Speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents- Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams - Road Traffic Signs – Types and Specifications – Road markings- Need for Road Markings- Types of Road Markings.

#### UNIT – IV

##### INTERSECTION DESIGN:

Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives – Traffic Islands and Design criteria- Design of Traffic Signals – Webster Method – IRC Method. Types of Grade Separated Intersections- Rotary

Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection.

## **UNIT – V**

### **HIGHWAY MATERIALS:**

Subgrade soil: classification – Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

## **UNIT – VI**

### **DESIGN OF FLEXIBLE PAVEMENTS:**

Objects & Requirements of pavements – Types – Functions of pavement components – Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

## **UNIT – VII**

### **DESIGN OF RIGID PAVEMENTS:**

Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

## **UNIT – VIII**

### **HIGHWAY CONSTRUCTION:**

Types of Highway Construction – Earthwork – Proportion of Sub grade – Construction of Earth Roads – Construction of Gravel Roads – Construction of Water Bound Macadam Roads – Construction of Bituminous Pavements – Construction of Cement Concrete Pavements.

### **Learning resources**

#### **Text books:**

1. Highway Engineering, (9<sup>th</sup> edition) by Khanna, S.K. and Justo ,C.E.G., Nem Chand Bros, Roorkee, 2010.
2. Traffic Engineering and Transportation Planning, (7<sup>th</sup> edition) by Kadiyali, L.R., Khanna Publishers, New Delhi, 2010.
3. Specifications for Roads and Bridges - Manual for Maintenance of roads, Most Publications, 1976.

#### **Reference books:**

1. Fundamentals of Transportation Engineering, (3<sup>rd</sup> edition) by Papacostas, C.S., Prentice Hall of India Pvt.Ltd, New Delhi, 2009.
2. Principles of Highway Engineering by Kadiyali, L.R., Khanna Publishers, New Delhi, 2012.
3. Traffic Planning and Design by Saxena, Dhanpat Rai Publishers, New Delhi, 2010.
4. Transportation Engineering - An Introduction, (3rd edition) by Jotin Khisty. C, Prentice Hall, Englewood Cliffs, New Jersey, 2012.