Th4. HIGHWAY ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

One of the major tasks carried out by civil engineering professionals is highway construction. Knowledge is essential on necessary geometric, materials, equipment essential for highway construction. The course aims to impart knowledge in this segment.

B. COURSE OBJECTIVES

On completion of the course students will be able to -

1. Realize significance of the highway transportation and professional bodies associated with this,
2. Acquaint themselves with road geometric terms and understand the purpose of providing necessary features including angles and curvature during road construction.
3. Select proper road construction materials based on required properties and test data.
4. Comprehend the pavements and their types and know the step wise construction processes.
5. Acquire knowledge on common construction equipment
6. Realize essence of drainage and maintenance on the highways and prescribe related practices.

C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Periods
1	Introduction	05
2	Road Geometrics	20
3	Road Materials	09
4	Road Pavements	13
5	Hill Roads	07
6	Road Drainage	07
7	Road Maintenance :	07
8	Construction equipments:	07

D. COURSE CONTENTS:

1 Introduction

1.1 Importance of Highway transportation: importance organizations like Indian roads congress, Ministry of Surface Transport, Central Road Research Institute.
1.2 Functions of Indian Roads Congress
1.3 IRC classification of roads
1.4 Organisation of state highway department

2 Road Geometrics

2.1 Glossary of terms used in geometric and their importance, right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation level, camber and gradient

2.2 Design and average running speed, stopping and passing sight distance

2.3 Necessity of curves, horizontal and vertical curves including transition curves and super elevation, Methods o f providing super – elevation

3 **Road Materials**

3.1 Difference types of road materials in use: soil, aggregates, and binders

3.2 Function of soil as highway Subgrade

3.3 California Bearing Ratio: methods of finding CBR valued in the laboratory and at site and their significance

3.4 Testing aggregates: Abrasion test, impact test, crushing strength test, water absorption test & soundness test

4 **Road Pavements**

4.1 Road Pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components

Flexible pavements:

4.2 Sub-grade preparation:

Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, borrow pits, making profile of embankment, construction of embankment, compaction, stabilization, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation

4.3 Sub base Course:

Necessity of sub base, stabilized sub base, purpose of stabilization (no designs)

Types of stabilization

- Mechanical stabilization
- Lime stabilization
- Cement stabilization
- Fly ash stabilization

4.4 Base Course:

Preparation of base course, Brick soling, stone soling and metalling, Water Bound Macadam and wet-mix Macadam, Bituminous constructions: Different types

4.5 Surfacing:

- Surface dressing
  (i) Premix carpet and (ii) Semi dense carpet
- Bituminous concrete
- Grouting

4.6 Rigid Pavements:

Concept of concrete roads as per IRC specifications

5 **Hill Roads:**

5.1 Introduction: Typical cross-sections showing all details of a typical hill road in cut, partly in cutting and partly in filling

5.2 Breast Walls, Retaining walls, different types of bends

6 **Road Drainage:**

6.1 Necessity of road drainage work, cross drainage works

6.2 Surface and sub-surface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage, intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections.

7 **Road Maintenance :**

7.1 Common types of road failures – their causes and remedies
7.2 Maintenance of bituminous road such as patch work and resurfacing
7.3 Maintenance of concrete roads – filling cracks, repairing joints, maintenance of shoulders (berm), maintenance of traffic control devices
7.4 Basic concept of traffic study, Traffic safety and traffic control signal

8 Construction equipments:

Preliminary ideas of the following plant and equipment:
8.1 Hot mixing plant
8.2 Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, graders, roller dragline
8.3 Asphalt mixer and tar boilers
8.4 Road pavers
8.5 Modern construction equipments for roads.

E. SYLLABUS COVERAGE UPTO INTERNAL ASSESSMENT: Chapters 1, 2, 3, 4

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	S.K.Khanna & C.E.G. Justo	Highway Engineering	Nem Chand & Bros
2	S.P.Chandola	A Text Book Of Transportation Engineering	S. Chand
3	S.P.Bindra	A course on Highway engineering	Dhanpat Rai Publications
4	S.K. Sharma	Principles, practices & design of Highway Enginnering.	S. Chand