

## **BRIDGE ENGINEERING**

**Course Outcomes:** At the end of the course, the student will be able to

- Design theories for super structure and substructure of bridges
- Design Culvert, R.C.C T Beam Bridge.
- Understand the behavior of continuous bridges, box girder bridges.
- Possess the knowledge to design prestressed concrete bridges.
- Design Railway bridges, Plate girder bridges, different types of bearings, abutments, piers and various types of foundations for Bridges

### **SYLLABUS**

#### **UNIT I**

Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces Seismic loads- Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.

#### **UNIT II**

Pigeaud's method-design of longitudinal girders- Guyon-Messonet method- Hendry Jaegar method- Courbon's theory. (Ref: IRC-21), voided slabs, Super Structure: Slab bridge- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- T-Beam bridges.

#### **UNIT III**

Box Culverts- Single Cell Box Culvert – Design Loads, Design Moments, Shears and Thrusts. Design of Critical sections.

#### **UNIT IV**

Plate girder bridges- Elements of plate girder and their design-web-flange- intermediate stiffener- vertical stiffeners- bearing stiffener-design problem

#### **UNIT V**

Sub structure- Abutments- Stability analysis of abutments- piers- loads on piers – Analysis of piers- Design problem(Ref: IRC-13, IRC-21, IRC-78)- Pipe culvert- Flow pattern in pipe culverts- culvert alignment-culvert entrance structure- Hydraulic design and structural design of pipe culverts- reinforcements in pipes .(Ref: IRC: SP-13)

### **TEXT BOOKS**

1. Design of Bridges by N. Krishna Raju CBS Publishers and Distributors
2. Design of Concrete Bridges- M.G. Aswini, V.N. Vazirani, M.M Ratwani, Khanna Publishers
3. Essentials of Bridge Engineering- Jhonson Victor D, 7e, Oxford IBH Publications