

## **CE5042W – Materials and Construction Technologies in Bridge Engineering**

**Credit Distribution:** C:9 L:3 T:0 P:0 E:0 O:6 TH:0

**Course Type:** Theory

**Description:** To provide students with understanding of: (1) Basic materials used in bridges and their microstructure, along with its performance in different structural and non-structural conditions. (2) The structural systems and technologies used for bridge constructions, along with various equipment required for the same.

**Course Content:** Concrete; Overview of concrete-making materials; typical mixtures used for bridges, and concepts of advanced mixture design methods; performance of concrete in monotonic and cyclic loading; time-dependent deformations in concrete; durability of reinforced concrete. Steel; Metallurgical and mechanical properties of structural steel; new generation structural steels for bridges; Material and manufacturing of steel cables; Material requirements and performance related to welding, fabrication, fatigue, fire and corrosion. Composites and Rubber; New generation and traditional materials for bearings - neoprene, POT PTFE and Cylindrical bearings; Steel-concrete composite decks; FRP for new construction & for strengthening; coatings Grouts Overview of Grout-making materials, important properties and testing methods; durability issues. Corrosion prevention encasements for cable-stayed and suspension bridges Structural Systems and Construction Technology Conventional in-situ, Precast, prestressed, segmental construction techniques; Common equipments used in construction of bridges; Erection Methods; Replacement of bearings and cables; Safety through design and in construction. Project Management; Lean Construction techniques; Project management technologies; Contract management; QC and QA monitoring.

**Text Books:** None

### **Reference Books**

- Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill, 2014.
- Advanced Concrete Technology, J. Newman and B.S. Choo, Eds., Elsevier, 2003.
- Materials for Civil and Construction Engineers, M.S. Mamlouk and J.P. Zaniwski, Second Edition, Pearson Prentice Hall, 2006.
- Essentials of Bridge Engineering, D.J. Victor, Fifth Edition, Oxford & IBH Publishing, 2001.
- Construction and Design of Pre Stressed Concrete Segmental Bridges, W. Podolny and J.M. Muller, John Wiley & Sons, 1982.
- Bridge Engineering, S. Ponnuswamy, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1999.

**Prerequisite:** NIL