

Course Name:

Repair and Rehabilitation of Structures using Fiber Reinforced Polymer

Course Number:

20021

Credit:

3

Course Content(outline):

- **Introduction**
 - a) Infrastructures
 - b) Deterioration of structures
 - c) Matrix-Thermoplastic resins
 - d) Fiber and composites form
- **Flexural Strengthening of Beams using FRP**
 - a) General design consideration
 - b) Design of externally bonded FRP systems
 - c) Failure modes
- **Shear Strengthening of Members using FRP**
 - a) Wrapping schemes
 - b) Nominal shear strength using FRP
- **Strengthening of Columns for Confinement using FRP**
 - a) Pure axial compression
 - b) Combined axial compression and bending
 - c) P-M diagram
- **Strengthening Unreinforced Masonry Walls using FRP**
 - a) Strengthening limits

- b) Effective strain and stress
- c) Strengthening for out-of-plane loads
- d) Strengthening for in-plane loads
- **Seismic Provisions for FRP systems**
 - a) Seismic strengthening overview
 - b) Confinement with FRP-plastic hinge
 - c) Confinement with FRP-lap splice clamping

REFERENCES:

- Strengthening of Concrete Structures Using Fiber Reinforced Polymers (FRP); Wu and Eamon
- Strengthening Design of Reinforced Concrete with FRP; Rasheed Advanced
- Fibre-Reinforced Polymer (FRP) Composites for Structural Applications, Bai
- The International Handbook of FRP Composites in Civil Engineering, Zoghi
- ACI 222R-01: “Corrosion of Metals in Concrete.”
- National Cooperative Highway Research Program (NCHRP) Report 514:” Bonded Repair and Retrofit of Concrete Structures Using FRP Composites.”
- ACI 440.02: “Guidelines for Design of Concrete Structures Externally Bonded with Epoxy Bonded FRP Composites.”
- ACI 440.3R-04: “Guide Test Methods for Fiber-Reinforced Polymers (FRPs) for Reinforcing or Strengthening Concrete Structures.”
- ACI 440.1R-03: “Guide for the Design and Construction of Concrete Reinforced with FRP Bars.”