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.”