

# CV4105 Prestressed Concrete

[Lectures: 26 hrs; Tutorials: 13 hrs; Pre-requisites: CV3011; Academic Unit: 3.0]

## **Learning Objective**

The objective is to equip the students with a thorough understanding of the behaviour and design of prestressed concrete beam, slab and column. Various time dependent factors, such as cracking, creep and shrinkage of concrete, and prestress losses, are discussed thoroughly. Background to design equations and relevant modern research will also be discussed to provide the students with solid understanding of the topics covered.

## **Course Content**

Properties of concrete; end blocks and anchorages; prestressed concrete beams under flexure and shear; immediate and time dependent prestress losses, initial and time-dependent deformation; Composite beams; statically indeterminate beams; connections; tension and compression members.

## **Course Outline**

### **S/N Topic**

- 1 Properties of Modern Concrete
  - Strength and durability, Time-dependent properties
  
- 2 End Block and anchorages
  
- 3 Prestressed concrete beams
  - Stresses in beams, Prestressed losses, Flexural design and analysis, Combined shear and bending
  
- 4 Serviceability behaviour of prestressed beams
  - Progressive cracking and control of deflections, Time-dependent camber/deflection of cracked beams
  
- 5 Continuous beams
  - Pressure Lines and Secondary Moments, Analysis of continuous beams
  
- 6 Prestressed concrete compression and tension members
  - Members subjected to tension, Compression members, Biaxially loaded columns, Moment interaction diagram
  
- 7 Design of precast connections
  - Simple connections and detailing for connections, etc., Moment connections

***Learning Outcome***

The students are expected to be able to understand the behaviour of prestressed concrete simple or continuous beams, columns and connections, upon learning the structural responses to different kinds of loads, particularly the prestressing effect at various stages. They should be able to design such beams, columns and connection details, with confidence using existing codes of practice, taking into account of the structural strength, service life and durability. It is also expected that the student would know the limitations of the design methods used.

***Textbooks/References***

BS EN 1992-1-1: 2004, Eurocode 2 – Design of Concrete Structures, British Standards Institution, 2004.