

## CE306 CONCRETE STRUCTURES AND DESIGN

**Co-ordinator:** Dr. R.L. Vollum (Room 323), Email: [r.vollum@imperial.ac.uk](mailto:r.vollum@imperial.ac.uk)

**Status:** Elective

**Lecturers:** Dr R.L. Vollum (RLV)  
Dr N.M. Tsang (NT)(328B)  
Dr. P. S. Chana (PSC)

**Structure:** 50 contact hours

**Links:** CE413 : recommended (advantageous)

### Aims

To develop a sound understanding of designing prestressed and reinforced concrete structures. The module extends the material covered in CE207. The application of theory to practice is demonstrated through a project to design a multistorey reinforced concrete building.

### SYLLABUS

#### Reinforced concrete (RLV -22 hours)

1. Design of sections in flexure (3 hours).
2. Design of continuous beams (4 hours)
3. Serviceability limit states of cracking and deflection (5 hours).
4. Shear and torsion (7 hours)
5. Design of slabs (2 hours)
6. Detailing (1 hour)

#### Conceptual design and construction methods (PSC -4 hours)

1. Conceptual design of building frames and slabs (2 hours)
2. Project organisation and construction methods (2 hours)

#### Prestressed concrete. (NT - 18 hours)

1. Introduction to design and construction of prestressed concrete beams (2 hours)
2. Description of design criteria and Magnel diagram for optimisation of beam sections (3 hours)
3. Determination of steel envelope for tendon profile design (2 hours)
4. Ultimate limit states of prestressed beam in moment and shear (2 hours)
5. Concordancy of tendon profiles for continuous prestressed beams (2 hours)
6. Concept of linear transformation and non-concordant tendon profiles (3 hours)
7. Introduction of Equivalent Load Concept (2 hours)
8. Evaluation of secondary prestressed moment (2 hours)

### Course work and submission dates

*(6 contact hours + private study)*

There will be two projects that are integrated into the lectures and apply theory studied in class to a realistic design problem. The reinforced concrete project is to design a multistory building and the prestressed concrete project to design a bridge, beam. In addition to the lectures, three hours of classroom time are timetabled for tutorials for each project. (Submission dates Prestressed concrete week 9, Reinforced concrete Friday week 23)

### **Assessment**

One three hour examination at the beginning of the summer term & project work. The examination paper contains 8 questions of which you must answer 5.

### **Recommended text books**

No text covers the whole module. A good introductory text is KONG & EVANS, Reinforced and Prestressed Concrete.

### **Learning Outcomes**

- Understand the fundamentals of reinforced and prestressed concrete design.
- Appreciate the differences in behaviour of reinforced and prestressed concrete and know when to use each material.
- be able to design a simple reinforced concrete building.