Engineering Tripos Part IIB, 4D8: Pre-stressed Concrete (shared with IIA), 2017-18

Module Leader
Prof T Ibell [1]

Lecturer
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Timing and Structure
Lent term. 16 lectures (including examples classes) + coursework. Assessment: 100% exam

Prerequisites
3D3 and 3D4 useful

Aims
The aims of the course are to:

- teach the principles of analysis and design of prestressed concrete, the principal way of using concrete for large structures, such as bridges.

Objectives
As specific objectives, by the end of the course students should be able to:

- understand the principles of prestressed concrete, and appreciate why it has important structural advantages.
- design and analyse statically determinate, composite and statically indeterminate prestressed concrete structures.
- predict when simple theories can be used, and when they are insufficient.
- be aware of the potential developments in new materials for prestressed concrete and the reasons for their adoption.

Content
Basic Principles (5L)
Introduction, other prestress applications, definitions: Section design, Magnel diagram, statically determinate structures; Limits on stress, practical considerations; Current problems; new horizons, new materials.
Indeterminate beams (3L)
Secondary moments, line of pressure; Concordant Profiles, linear transformations; Design approaches for continuous beams, bridges.

Strength Calculations (3L)
Ultimate strength (simple modifications to RC theory); Shear failure and prevention. Truss analogy for special cases.

Creep and shrinkage (3L)
Loss of prestress, effective modulus method and rate of creep methods; Composite construction and construction sequence effects; Creep followed by load to failure. Effects of temperature.

Bridge Design (2L)
Case studies of bridges.

Coursework
This will consist of two parts: (i) carrying out a test on a prestressed concrete beam, plus a write-up, and (ii) a short design exercise.

[Coursework Title]
Learning objectives:

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Practical information:

• Sessions will take place in [Location], during week(s) [xxx].
• This activity [involves/doesn't involve] preliminary work ([estimated duration]).

Full Technical Report:
Students [will/won't] have the option to submit a Full Technical Report.

Booklists
Please see the Booklist for Group D Courses [2] for references for this module.

Examination Guidelines
UK-SPEC

The UK Standard for Professional Engineering Competence (UK-SPEC) [4] describes the requirements that have to be met in order to become a Chartered Engineer, and gives examples of ways of doing this.

UK-SPEC is published by the Engineering Council on behalf of the UK engineering profession. The standard has been developed, and is regularly updated, by panels representing professional engineering institutions, employers and engineering educators. Of particular relevance here is the ’Accreditation of Higher Education Programmes’ (AHEP) document [5] which sets out the standard for degree accreditation.

The Output Standards Matrices [6] indicate where each of the Output Criteria as specified in the AHEP 3rd edition document is addressed within the Engineering and Manufacturing Engineering Triposes.

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Links
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