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:

- understand the analysis and design of prestressed concrete.
- understand various issues associated with prestressed concrete which are core to its success.

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.
- be able to design and analyse statically determinate, composite and statically indeterminate prestressed concrete structures.

Content

Basic Principles (7L)

Introduction, 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, design approaches for continuous beams.

Strength Calculations (3L)

Ultimate strength (simple modifications to RC theory), shear failure and prevention.

Losses and the long term (3L)

Loss of prestress, creep, composite construction.

Coursework

This will consist of carrying out a test on a prestressed concrete beam, plus a write-up.

Prestressed Concrete Laboratory

Learning objectives:

- To understand how concrete can be prestressed
- To see the effect which such prestress has on a beam
- To observe failure of a prestressed concrete beam

Practical information:

- Sessions will take place in the Structures Laboratory on dates yet to be determined.
- This activity doesn't involve preliminary work.

Booklists

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

Examination Guidelines

Please refer to Form & conduct of the examinations [3].

UK-SPEC

This syllabus contributes to the following areas of the UK-SPEC [4] standard:

Toggle display of UK-SPEC areas.

GT1

Develop transferable skills that will be of value in a wide range of situations. These are exemplified by the Qualifications and Curriculum Authority Higher Level Key Skills and include problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills. They also include planning self-learning and improving performance, as the foundation for lifelong learning/CPD.

IA1

Apply appropriate quantitative science and engineering tools to the analysis of problems.

IA2

Demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs.

KU1

Demonstrate knowledge and understanding of essential facts, concepts, theories and principles of their engineering discipline, and its underpinning science and mathematics.

KU2

Have an appreciation of the wider multidisciplinary engineering context and its underlying principles.

D1

Wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations.

S1

The ability to make general evaluations of commercial risks through some understanding of the basis of such risks.

E1

Ability to use fundamental knowledge to investigate new and emerging technologies.

E2

Ability to extract data pertinent to an unfamiliar problem, and apply its solution using computer based engineering tools when appropriate.

P1

A thorough understanding of current practice and its limitations and some appreciation of likely new developments.

P3

Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc).

US1

A comprehensive understanding of the scientific principles of own specialisation and related disciplines.

US4

An awareness of developing technologies related to own specialisation.

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[1] mailto:tji10@cam.ac.uk
[2] http://to.eng.cam.ac.uk/teaching/courses/y4/Booklist-IIB-GroupD.pdf
[3] https://teaching.eng.cam.ac.uk/content/form-conduct-examinations
[4] https://teaching.eng.cam.ac.uk/content/uk-spec