



Teaching Behaviour and Approximate Analysis of Structural Systems

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Abstract

A new and innovative master's level course has been developed at University College London (UCL) offering a systematic grounding in the behaviour of structural systems. Students are taught how to tackle complicated structural problems using a combination of simpler structural subsystems. In so doing, students are encouraged to examine the underlying physics of the problems and how this might influence the overall structural form and composition of structural systems. To enable confident and intuitive decision making, structural systems are first presented in qualitative terms. Once essential decisions on the composition of the structural system have been made, students are then shown how to provide initial estimates of element sizes and cost comparisons through approximate structural analysis techniques. Furthermore, students are then made aware of how these methods can be used at later project stages to judge the accuracy of solutions to more detailed, computer-aided approaches. The course is organised around a set of structural subsystems. Each is taught in terms of their behaviour, application, methods of approximate analysis, and preliminary design procedures.

Keywords: Structures Teaching, Structural Systems, Structural Behaviour, Approximate Analysis

1 Introduction

The proliferation of advanced computer-aided design technologies such as the finite element method has led to a fundamental questioning of the relevance of much of conventional teaching in structural mechanics. Much is being debated about what 'fundamentals' ought to be taught and what place should commercial finite element (FE) packages hold in this teaching. Some, mostly on the academic side argue that traditional hand calculation methods still have their place in teaching the basic concepts of structural mechanics and structural behaviour. On the other hand a growing number of people, often at the commercial end of the profession, claim that structural engineering is now much more about the efficient and robust management of a string computer modelling processes and that too much emphasis on the physics of structural mechanics is an unhelpful distraction. Computer modelling tools are also fundamentally redefining the relationship between architects and structural

engineers to an extent that is still largely unknown.

Whatever the answer to these questions is, it seems fairly clear that 'business as usual' in teaching structural mechanics will not do for much longer so the time is ripe for experimenting. At University College London (UCL), we have decided to develop a new course module called 'preliminary design and approximate analysis of structural systems'. This module will furnish UCL graduates with an intuitive understanding of structural behaviour, placing them in a position to confidently make key structural decisions and to rapidly assess the dependability of the results from intricate computer models.

2 Motivations and course objectives

Finite element packages have been great enablers for the structural engineering profession. However it is also arguable that they limit the structural engineer's contribution at the conceptual design phase due to the significant investment in time necessary for their implementation. Having the