

Engineering Tripos Part IIA Project, GD4: Civil Engineering Design Project, 2017-18

Leader

[Dr S K Haigh](#) [1]

Timing and Structure

Fridays 11-1pm, and Tuesdays 9-11am plus afternoons

Prerequisites

Either 3D3 or 3D8

Aims

The aims of the course are to:

- To understand the major components and working principles of a facade;
- To understand the loads and environmental conditions imposed on facades;
- To understand the structural and environmental performance requirements of facades;
- To generate viable facade solutions (scheme designs) and to develop detailed facade design
- To quantitatively assess the performance of the facade solutions;
- To establish the construction sequence and maintenance regime for high performance building envelopes;
- To appreciate the multi-disciplinary nature and the environmental impact of an engineering project.

Content

The external fabric of a building (sometimes referred to as the building envelope or facade) has a significant influence on the environmental, structural and aesthetic qualities of the building. It also constitutes up to 30% of construction costs and often includes: novel materials, energy production technologies, and/or complex geometry. Real world facade design also involve several conflicting performance requirements e.g. the demand for larger glazed openings to allow more natural light vs. the need to minimise glazed openings to reduce unwanted heat loss / heat gain. As a result the design of building envelopes requires a multi-disciplinary approach and careful quantitative analysis. The project aims to introduce the range of performance requirements and the options available in the high performance facades. The project also aims to develop a deep understanding of how fundamental principles of building physics and structures can be used to provide an integrated and evidence-driven solution.

FORMAT

Students normally work in groups of three, but are responsible for and author specific parts of the reports. Groups can capitalise on a broader range of ideas for the overall conceptual designs, and can deal more comprehensively with the detailed design.

Week 1

Site characterisation client requirements, environmental conditions and requirements, structural loads and requirements, site-specific issues. (Students should be prepared to attend a field trip for the whole day on Friday.). At the end of week 1, students should aim to compile a facade design brief listing all requirements and constraints

on their impending designs.

Week 2

Scheme designs students will develop two viable and distinct facade solutions for the site. An interim report is due at the end of week 2. This should include the following: Investigation of existing cladding (if any), building and site analysis; proposed facade design criteria; facade options (showing 2 clearly distinct solutions); recommended option and reasons for your choice.

Week 3 and 4

Develop the scheme design into a fully detailed facade design proposal. A final report is due at the end of week 4. This should include: A copy of the interim scheme design report (updated / corrected as necessary); sufficient structural and building physics calculations to allow sizing and detailing of main components; general arrangement drawings and drawings of typical facade details. The level of detail required in this final report should be sufficient to allow an accurate assessment of the performance of the facade and to enable accurate costing (although the latter will not be performed in this project).

Coursework

Coursework	Due date	Marks
Interim Report	4pm Tuesday 22 May 2018	30 (15 for individual and 15 for group work)
Final report	4pm, Friday 8 June 2018	50 (35 for individual and 15 for group work)

Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [2].

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Links

[1] <mailto:skh20@cam.ac.uk>

[2] <https://teaching24-25.eng.cam.ac.uk/content/form-conduct-examinations>

