

MECH4429 Integrated Capstone Experience

Capstone Project for Building Services Engineering
<http://me.hku.hk/bse/capstone/>

Redevelopment of the Robert Black College at HKU for the University Guest House

1. Background Information

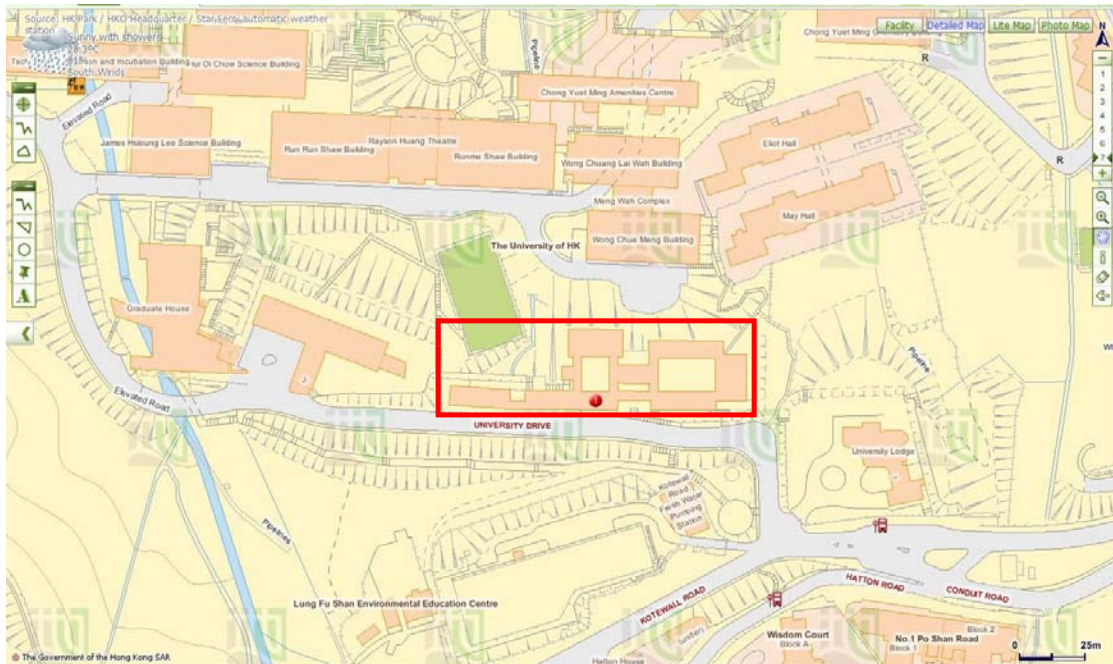


Figure 1. Site location (site area: 3,800 m²) [Source: www.map.gov.hk]



Figure 2. Current outlook of the Robert Black College (at University Drive)

Robert Black College (www.rblack.hku.hk) was established in 1967 primarily as a guest house of The University of Hong Kong (HKU) for visiting scholars from overseas and the mainland China. The building complex is situated in a scenic spot of HKU main campus in mid-level on the western side of Hong Kong Island.

2. Purpose and Scope of the Project

The aim of this project is to investigate possible options and develop the technical building design for the redevelopment of the Robert Black College (RBC) at The University of Hong Kong (HKU). The students should study the important factors affecting the design of the building and its Building Services systems so as to formulate appropriate design solutions and development strategies for the project. The new University Guest House will provide room and board facilities in a pleasant and convenient environment for guests and visitors on short periods of stay in the University.

After the construction, the building will provide space for the functions as described in Table 1. The exact location and arrangement of the rooms shall be proposed by the design team with clear justification. The project development and building design should demonstrate good practices in sustainable and energy efficient design with environmentally-friendly and cost-effective design solutions.

Table 1. Proposed space requirements (total gross floor area = 16,000 m²)

Space	Area (m ²)	Description
Guest rooms	10,000	For 200 guest rooms
Functional areas	2,000	For ballroom, banquet and meeting rooms
Recreation areas	400	For swimming pool, gym, games and changing rooms
Food and beverages	400	For coffee shop, restaurants and lobby bar
Food preparation	400	For kitchens, pantries and storage
Lobby and public space	300	For lobby, entrance, seating and retail
Receiving and storage	300	For loading, receiving, purchasing and storage
Administration	300	For front office, sales and catering, accounting
Employee areas	300	For personnel office, training, lockers and toilets
Laundry and house keeping	300	For laundry, linen, storage and house keeping
Engineering	300	For office, workshops and storeroom
Plant rooms	1,000	For the Building Services systems

The initial estimate of the total construction cost for this project is HK\$800 millions. The preliminary timeline for the development is 24 months. It is expected that the construction work may commence in 2016. The design team might also propose some reasonable assumptions for the design and construction of the project. These assumptions should be confirmed with the tutors.

The complex is scheduled for completion in 2017-18. In addition to adhering to the sustainability principles outlined in the University's Master Plan, the design and construction of the new building will follow the requirements of sustainable green building such as the BEAM Plus assessment method and the LEED green building rating (see the weblinks below for details).

BEAM Plus Project Assessment (BEAM Society), <http://www.hkgbc.org.hk/eng/beamplus-main.aspx>
LEED green building rating (US Green Building Council), <http://www.usgbc.org/leed>

3. Design Process and Technical Analysis

Students will form groups of 4 to 5 members to work as a team on the project. Skills for team working, project development and design coordination are required. The building design process is divided into four main stages (see Appendix I for details). The aim is to give a clear guideline for each student team to develop their design solutions in a systematic way. The four key stages of the building design process will be completed in Semester 1.

- (a) Appraisal
- (b) Design Brief
- (c) Concept
- (d) Design Development

In Semester 2, each student will identify a suitable topic or area to carry out technical analysis for investigating the building design solutions, building performance or other related technical or environmental issues. The topic of technical analysis will be determined before the end of Semester 1. Students are expected to develop individual study and writing skills in the technical analysis.

At each stage, students are required to carry out assessments, design analyses, evaluations, design calculations, technical drawings, etc. for developing the design solutions. Design tutorials, seminars, technical visits and company visits will be arranged to allow students to interact and discuss with the design tutors and other professionals. This will enhance their understanding and arouse their interest in the design evaluation process. Details of these activities will be provided during the course.

4. Assessment Methods

Assessment will be based on the following components (total 100 marks):

(a) Semester 1 (50 marks)

Semester 1 interim report = 10 marks
Semester 1 oral presentation = 10 marks
Semester 1 design report = 30 marks

(b) Semester 2 (50 marks)

Semester 2 oral presentation = 10 marks
Semester 2 technical report = 40 marks

Submissions of reports should be punctual. Late submission may receive reduction in marks. The general assessment criteria include quality of the content, clarity of thought, teamwork skills, communication skills (oral, graphic and written), report organization, innovation and creativity.

References (on Building Services Design):

- Churcher, D., 2009. *A Design Framework for Building Services: Design Activities and Drawing Definitions*, 2nd ed., Building Services Research and Information Association, Bracknell, Berkshire, England. [692.1 C56]
- Hall, F. and Greeno, R., 2011. *Building Services Handbook*, 6th ed., Butterworth-Heinemann, Oxford, U.K. [690 H17][ebook via ebrary]
- Pennycook, K., 2007. *Design Checks for HVAC: A Quality Control Framework*, BSRIA Guide BG 4/2007, 2nd ed., Building Services Research and Information Association, Bracknell, Berkshire, England. [697 R1][AV 697 P416]
- Pennycook, K. 2006. *Design Checks for Electrical Services*, Application Guide BG 3/2006, Building Services Research and Information Association, Bracknell, Berkshire, England. [628.0941 P41][AV 621.31924 P41 d]
- Pennycook, K. 2006. *Design Checks for Public Health Engineering*, Application Guide BG 2/2006, Building Services Research and Information Association, Bracknell, Berkshire, England. [621.31924 P4][AV 621.31924 P4 d]

Useful Websites:

Useful Info for Building Services Design, <http://www.mech.hku.hk/bse/capstone/bs-design.htm>

Student Notes for Building Services Engineering, <http://www.bsenotes.com>

Building Energy Efficiency and Sustainable Building Design, <http://www.mech.hku.hk/bse/bee-sbd/>

Sustainable Design for Buildings [ArchSD], <http://www.archsd.gov.hk/archsd/html/teachingkits/TK1/>

Appendix I

Stages of Design Process

(a) Appraisal:

1. Identify client's needs and objectives
2. Evaluate business case and possible constraints on development
3. Prepare feasibility studies and assess options

(b) Design Brief:

4. Develop initial statement of requirements
5. Confirm key requirements and constraints
6. Identify procurement method and organisational structure

(c) Concept:

7. Implement design brief and prepare additional data
8. Prepare concept design (outline proposals, specifications, cost plan)
9. Review procurement route

(d) Design Development:

10. Develop concept design
11. Complete project brief
12. Apply detailed planning permission

RIBA Outline Plan of Work (Work Stages A to E and Key Tasks)*

RIBA Work Stages		Description of key tasks	OGC Gateways
Preparation	A Appraisal	Identification of client's needs and objectives, business case and possible constraints on development. Preparation of feasibility studies and assessment of options to enable the client to decide whether to proceed.	1 Business Justification
	B Design Brief	Development of initial statement of requirements into the Design Brief by or on behalf of the client confirming key requirements and constraints. Identification of procurement method, procedures, organisational structure and range of consultants and others to be engaged for the project.	2 Procurement strategy
Design	C Concept	Implementation of Design Brief and preparation of additional data. Preparation of Concept Design including outline proposals for structural and building services systems, outline specifications and preliminary cost plan. Review of procurement route.	3A Design Brief and Concept Approval
	D Design Development	Development of concept design to include structural and building services systems, updated outline specifications and cost plan. Completion of Project Brief. <i>Application for detailed planning permission.</i>	
	E Technical Design	Preparation of technical design(s) and specifications, sufficient to co-ordinate components and elements of the project and <i>information for statutory standards and construction safety.</i>	3B Detailed Design

* Source: Royal Institute of British Architects (RIBA)

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Schedule of Activities 2014-2015

Semester 1: Building Design Process

Monday 14:30-17:30, Venue: To be confirmed

Work Stages	Week	Date	Description
Appraisal	1	01-Sep-2014	Introduction + Technical Visit <ul style="list-style-type: none"> • 14:30-15:30 Introduction to the Project • 15:30-17:00 Technical visit: Robert Black College
	2	08-Sep-2014	Seminar + Design Tutorials <ul style="list-style-type: none"> • 14:30-16:00 Seminar: Green Building Design • 16:00-17:00 Design Tutorials
Design Brief	3	15-Sep-2014	Seminar + Design Tutorials <ul style="list-style-type: none"> • 14:30-16:00 Seminar: Fire Safety and Statutory Issues • 16:00-17:00 Design Tutorials
Concept Design	4	22-Sep-2014	Seminar + Design Tutorials <ul style="list-style-type: none"> • 14:30-16:00 Seminar: BSE Design Guides • 16:00-17:00 Design Tutorials
	5	29-Sep-2014	Design Tutorials <ul style="list-style-type: none"> • 14:30-17:00 Design Tutorials
	6	06-Oct-2014	Design Tutorials <ul style="list-style-type: none"> • 14:30-17:00 Design Tutorials
	7	13-Oct-2014	[Reading/field trip week] 13_18-Oct-2014 (Submit Interim Report on or before 13 Oct 2014)
Design Development	8	20-Oct-2014	Feedbacks + Design Tutorials <ul style="list-style-type: none"> • 14:30-15:30 Feedbacks on Interim Report • 15:30-17:00 Design Tutorials
	9	27-Oct-2014	Design Tutorials <ul style="list-style-type: none"> • 14:30-17:00 Design Tutorials
	10	03-Nov-2014	Design Tutorials <ul style="list-style-type: none"> • 14:30-17:00 Design Tutorials
	11	10-Nov-2014	Design Tutorials <ul style="list-style-type: none"> • 14:30-17:00 Design Tutorials
	12	17-Nov-2014	Semester 1 Presentation <ul style="list-style-type: none"> • 14:30-17:00 Oral presentations
	13	24-Nov-2014	Deadline for submitting Semester 1 Report

Semester 2: Technical Analysis

Monday 14:30-17:30, Venue: To be confirmed

Work Stages	Week	Date	Description
Literature Study	1	19-Jan-2015	Feedbacks + Introduction <ul style="list-style-type: none"> • 14:30-15:30 Feedbacks on Semester 1 Report • 15:30-17:00 Introduction to Technical Analysis
	2	26-Jan-2015	Project Meetings <ul style="list-style-type: none"> • 14:30-17:00 Project Meetings
	3	2-Feb-2015	Project Meetings <ul style="list-style-type: none"> • 14:30-17:00 Project Meetings
Methodology	4	09-Feb-2015	Project Meetings <ul style="list-style-type: none"> • 14:30-17:00 Project Meetings
	5	16-Feb-2015	Project Meetings <ul style="list-style-type: none"> • 14:30-17:00 Project Meetings
Technical Analysis	6	23-Feb-2015	[Chinese New Year holiday] (No class)
	7	02-Mar-2015	Project Meetings <ul style="list-style-type: none"> • 14:30-17:00 Project Meetings
	8	09-Mar-2015	[Reading/field trip week] 9_14-Mar-2015
	9	16-Mar-2015	[HKU Foundation Day holiday] (No class)
Report Writing	10	23-Mar-2015	Project Meetings <ul style="list-style-type: none"> • 14:30-17:00 Project Meetings
	11	30-Mar-2015	Project Meetings <ul style="list-style-type: none"> • 14:30-17:00 Project Meetings
	12	06-Apr-2015	[Easter Monday holiday] (No class)
	13	13-Apr-2015	Semester 2 Presentation <ul style="list-style-type: none"> • 14:30-17:00 Oral presentations
	14	20-Apr-2015	Deadline for submitting Semester 2 Report