

# MECH4429 Integrated Capstone Experience

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

## Building Services Systems for Adaptive Re-use of Eliot Hall and May Hall

### 1. Background Information and History

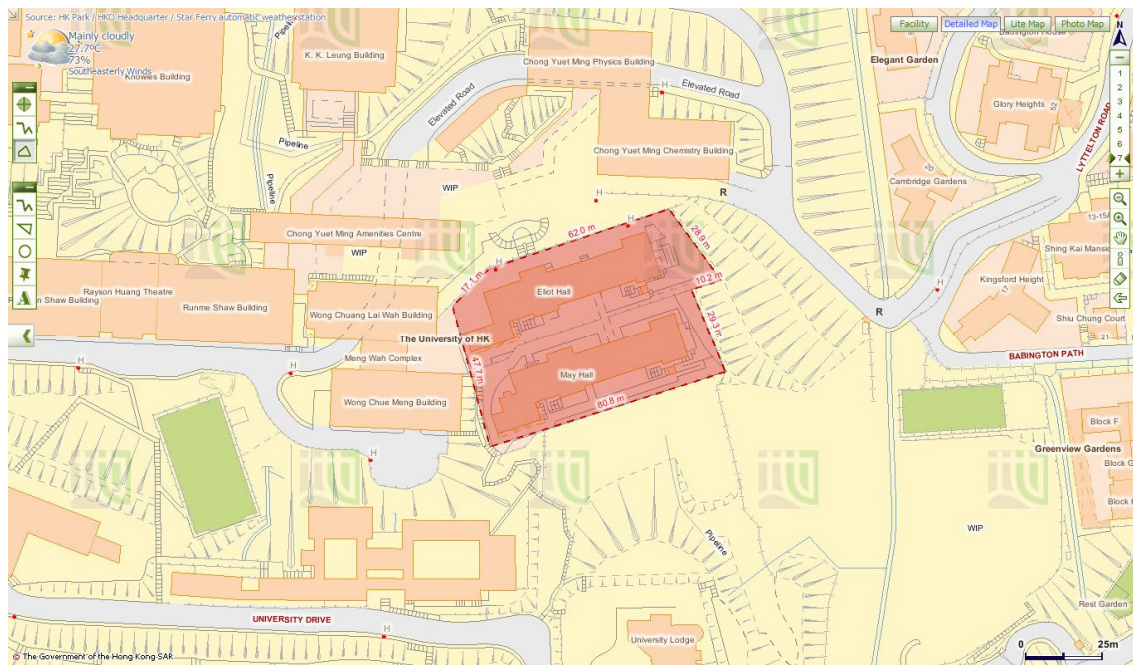


Figure 1. Site location at HKU (site area: 4,423 m<sup>2</sup>) [Source: [www.map.gov.hk](http://www.map.gov.hk)]



Figure 2. Current and historic pictures of Eliot Hall and May Hall

Eliot Hall and May Hall were opened in 1914 and 1915 respectively. They were named after Sir Charles Eliot, the first Vice-Chancellor of the University and Sir Francis Henry May, the 15th Governor of Hong Kong. Together with Lugard Hall which was opened in 1913, these three-storey red-brick buildings were originally used as student hostels. When the Japanese invaded Hong Kong at the end of 1941, these buildings became part of a temporary relief hospital set up to provide additional support to Queen Mary Hospital.

Torrential rain and landslides in 1966 necessitated repairs to Eliot and May Halls. When the works were completed, these three buildings were combined into one residential unit, renamed "Old Halls",

in 1969. When Lugard Hall was subsequently demolished in 1992 to make way for campus redevelopment, the Old Halls became obsolete and the two remaining wings reverted back to using their old names of Eliot Hall and May Hall. These two buildings have been converted into University offices and classrooms for teaching and research purposes. Their position halfway uphill on the main campus provides a magnificent view of western Hong Kong island and the harbour beyond.

## **2. Purpose and Scope of the Project**

The aim of this capstone project is to investigate possible options and develop the technical design of Building Services systems for adaptive re-use of Eliot Hall and May Hall at The University of Hong Kong (HKU). The students should study the important factors and limitations affecting the design of the Building Services systems and develop appropriate design solutions and development strategies for the buildings.

After the adaptive re-use construction, the two buildings 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 = 4,800 m<sup>2</sup>)**

<b>Space</b>	<b>Area (m<sup>2</sup>)</b>	<b>Description</b>
Office areas	2,400	For individual and open-plan offices
Function areas	1,000	For meetings and other academic functions
Exhibition areas	300	For exhibits on the history of Old Halls
Classroom areas	300	For innovative classrooms
Plant rooms and lavatory	800	For the Building Services systems

The initial estimate of the total construction cost for this project is HK\$20 millions. The preliminary timeline for the development is 12 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.

## **3. Adaptive Re-use of Historic Building**

Adaptive re-use of buildings is often the only way that the historic and aesthetic values can be saved economically and heritage buildings can be brought up to contemporary standards (BD, 2012). As most of the heritage buildings were built long time ago, their design and facilities provided usually do not comply with current building safety and health standards and statutory requirements. Certain degree of alterations and additions is usually required if new facilities are to be installed or if the buildings are to be adapted for re-use other than their original use.

Conservation of historic buildings is significant to a society for protecting its cultural resources and preserving important heritage (CIBSE, 2002). To promote the active use and care of historic buildings, attention must be paid to the design and management of Building Services systems. Upgrading of the Building Services systems requires creativity to respect the original design and materials while meeting applicable codes and occupant needs. Management of historic buildings and their systems often has to strike a balance between retaining original building features and accommodating new technologies and equipment (Hui and Leung, 2004).

## **4. 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 (Detail Design)

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 which are directly or indirectly associated with the design work in Semester 1. The topic of technical analysis should be determined and approved by the tutors 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 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.

## 5. 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 (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]

## References (Historic/Heritage Buildings):

- BD, 2012. *Practice Guidebook on Compliance with Building Safety and Health Requirements under the Buildings Ordinance for Adaptive Re-use of and Alteration and Addition Works to Heritage Buildings 2012*, Buildings Department (BD), Hong Kong. (available at <http://www.bd.gov.hk/english/documents/guideline/heritage.pdf>)
- CIBSE, 2002. *Guide to Building Services for Historic Buildings: Sustainable Services for Traditional*

*Buildings*, Chartered Institution of Building Services Engineers (CIBSE), London. [720.288 G94]  
Hui, C. M. and Leung, H. M., 2004. Sustainable building services systems for historic buildings, In *Proceedings of the Joint Symposium 2004: Servicing Dense Built Environments*, 16 November 2004, Hong Kong SAR, pp. 133-142. (available at <http://web.hku.hk/~cmhui/js04-hui.pdf>)

#### **Useful Websites (HKU):**

Floor plans of HKU buildings [http://www.safety.hku.hk/homepage/manual\\_Floorplan.html](http://www.safety.hku.hk/homepage/manual_Floorplan.html)  
Eliot Hall <http://www.safety.hku.hk/homepage/pdf/FPEH13.pdf>  
May Hall <http://www.safety.hku.hk/homepage/pdf/FPMH13.pdf>

Visit HKU, <http://www.hku.hk/visit/>

#### **Useful Websites (Historic/Heritage Buildings):**

Adaptive Reuse:

Adaptive Reuse (Wikipedia), [http://en.wikipedia.org/wiki/Adaptive\\_reuse](http://en.wikipedia.org/wiki/Adaptive_reuse)  
Adaptive Reuse (Inhabitat) <http://inhabitat.com/tag/adaptive-reuse/>  
Adaptive Reuse (MIT campus), <http://www.archinode.com/lcaadapt.html>

Architecture in Hong Kong: Teaching Kit for the Appreciation of Architecture in Secondary School Curriculum -- Liberal Studies:

Topic 08 -- Conservation & Revitalization of Historic Buildings  
[http://minisite.proj.hkedcity.net/hkiakit/eng/LS/lesson\\_8.html](http://minisite.proj.hkedcity.net/hkiakit/eng/LS/lesson_8.html)

Topic 09 -- Conservation Policy in Hong Kong  
[http://minisite.proj.hkedcity.net/hkiakit/eng/LS/lesson\\_9.html](http://minisite.proj.hkedcity.net/hkiakit/eng/LS/lesson_9.html)

Topic 10 -- Revitalizing Historic Buildings in Hong Kong  
[http://minisite.proj.hkedcity.net/hkiakit/eng/LS/lesson\\_10.html](http://minisite.proj.hkedcity.net/hkiakit/eng/LS/lesson_10.html)

Conserve and Revitalise Hong Kong Heritage, <http://www.heritage.gov.hk>

#### **Useful Websites (Building Services Design):**

Building design process [http://www.designingbuildings.co.uk/wiki/Building\\_design\\_process](http://www.designingbuildings.co.uk/wiki/Building_design_process)

Design Documentation Guidelines (New Zealand Construction Industry Council)  
<http://www.nzcic.co.nz/Design.cfm>

Site analysis - Wikipedia [http://en.wikipedia.org/wiki/Site\\_analysis](http://en.wikipedia.org/wiki/Site_analysis)

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

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

#### **Useful Websites (Sustainable Building Design):**

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/>

Whole Building Design Guide (WBDG), <http://www.wbdg.org/>

## 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. Application for detailed planning permission.	
	E	Technical Design	Preparation of technical design(s) and specifications, sufficient to co-ordinate components and elements of the project and information for statutory standards and construction safety.	3B Detailed Design

\* Source: Royal Institute of British Architects (RIBA)



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### Schedule of Activities 2015-2016

#### Semester 1: Building Design Process

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

Work Stages	Week	Date	Description
Appraisal	1	02-Sep-2015	Introduction + Technical Visit • 14:30-15:30 Introduction to Adaptive Reuse and the Project • 15:30-17:00 Technical visit
	2	09-Sep-2015	Technical Visit: Dr Sun Yat-sen Museum • 14:30-17:00 Technical visit
Design Brief	3	16-Sep-2015	Seminar + Design Tutorials • 14:30-16:00 Seminar: Green Building Design • 16:00-17:00 Design Tutorials
Concept Design	4	23-Sep-2015	Seminar + Design Tutorials • 14:30-16:00 Seminar: Fire Safety and Statutory Issues • 16:00-17:00 Design Tutorials
	5	30-Sep-2015	Seminar + Design Tutorials • 14:30-16:00 Seminar: BSE Design Guides • 16:00-17:00 Design Tutorials
	6	07-Oct-2015	Design Tutorials • 14:30-17:00 Design Tutorials
	7	14-Oct-2015	[Reading/field trip week] 12_17-Oct-2015 (Submit <b>Interim Report</b> on or before 14 Oct 2015)
Design Development	8	21-Oct-2015	[Chung Yeung Festival holiday] (No class)
	9	28-Oct-2015	Design Tutorials Feedbacks + Design Tutorials • 14:30-15:30 Feedbacks on Interim Report • 15:30-17:00 Design Tutorials
	10	04-Nov-2015	Design Tutorials • 14:30-17:00 Design Tutorials
	11	11-Nov-2015	Design Tutorials • 14:30-17:00 Design Tutorials
	12	18-Nov-2015	<b>Semester 1 Presentation</b> • 14:30-17:00 Oral presentations
	13	25-Nov-2015	Deadline for submitting <b>Semester 1 Report</b>

## Semester 2: Technical Analysis

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

Work Stages	Week	Date	Description
Literature Study	1	20-Jan-2016	Feedbacks + Introduction • 14:30-15:30 Feedbacks on Semester 1 Report • 15:30-17:00 Introduction to Technical Analysis
	2	27-Jan-2016	Project Meetings • 14:30-17:00 Project Meetings
	3	03-Feb-2016	Project Meetings • 14:30-17:00 Project Meetings
Methodology	4	10-Feb-2016	[Chinese New Year holiday] (No class)
	5	17-Feb-2016	Project Meetings • 14:30-17:00 Project Meetings
Technical Analysis	6	24-Feb-2016	Project Meetings • 14:30-17:00 Project Meetings
	7	02-Mar-2016	Project Meetings • 14:30-17:00 Project Meetings
	8	09-Mar-2016	[Reading/field trip week] 7_12-Mar-2016
	9	16-Mar-2016	[HKU Foundation Day holiday] (No class)
Report Writing	10	23-Mar-2016	Project Meetings • 14:30-17:00 Project Meetings
	11	30-Mar-2016	Project Meetings • 14:30-17:00 Project Meetings
	12	06-Apr-2016	Project Meetings • 14:30-17:00 Project Meetings
	13	13-Apr-2016	<b>Semester 2 Presentation</b> • 14:30-17:00 Oral presentations
	14	20-Apr-2016	Deadline for submitting <b>Semester 2 Report</b>