

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

Semester 2: Technical Analysis

This Capstone Project provides students good opportunities to appreciate the building design process in Semester 1. To enable students to develop further the skills for problem solving and independent research, each student will identify a suitable topic or area to carry out technical analysis in Semester 2 for investigating the building design solutions, building performance or other related technical or environmental issues. Students are expected to develop individual study and writing skills in the technical analysis.

1. Possible Topics of Technical Analysis

Students have the freedom to select or propose a suitable topic of technical analysis. The proposed topic should be confirmed with the tutors before commencing. Students are encouraged to discuss with the tutors about how to select and formulate a suitable topic. The possible topics of technical analysis are shown in Table 1. This list is not exhaustive and students may suggest other topics related to building services engineering and the main theme of the Capstone Project.

Normally, the student should first identify one or two areas/topics that he/she is most interested in. Then, the student can develop a title for the study and propose the main study objective(s) for the technical analysis. He/she should send the information to the tutors and discuss how to formulate a suitable topic (**Deadline for submitting topic: 26 Jan 2015**). The tutors will give advice and then confirm the topic if satisfactory.

When doing the technical analysis in Semester 2, project meetings, seminars, technical visits will be arranged to allow students to interact and discuss with the design tutors or other professionals. This will enhance their understanding and arouse their interest in the analysis process. Details of these activities will be provided during the course.

2. Requirements and Process of Technical Analysis

Students are encouraged to apply fundamental principles in the technical analysis and promote creativity and innovation in the study. They may also relate and apply the knowledge they have learnt from other subjects for developing the analysis. At the end of the technical analysis, the students are required to write a full report comprising of all the work that have been done. They are also required to present their findings orally in English.

The students are expected to show that they are able to work independently, solve problems, adapt to various situations, and have self-confidence. The study enables students to enhance their generic skills through various means such as discussion with lecturer/supervisor and professionals from industries, self-learning, writing report, and oral presentation. Sometimes students may work in a group whereby they can help each other. It is emphasized that during the technical analysis process students are required to produce their own original data. Any means of plagiarism is strictly prohibited.

The technical analysis should be carried out in a systematic way and the following steps are suggested for managing the study process. Students should manage their time and plan all activities related to the study in order to finish the work within the given time limit.

- Literature Study (3 weeks)
- Methodology (2 weeks)
- Technical Analysis (4 weeks)
- Report Writing (4 weeks)

Table 1. Possible topics of technical analysis

<p>Climate and solar conditions:</p> <ul style="list-style-type: none"> • Bioclimatic analysis • Climate analysis • Site analysis (detailed) • Solar load analysis • Sun and shading analysis • Wind and air flow analysis <p>Construction methods and project management:</p> <ul style="list-style-type: none"> • Building cost analysis • Building information modelling BIM analysis • Critical path network analysis • Economic analysis • Value engineering analysis <p>Electrical services systems:</p> <ul style="list-style-type: none"> • Electrical fault analysis • Harmonic analysis • Motor starting analysis • Protective device coordination analysis • Power flow and power factor analysis • Short circuit analysis • Switching transient modelling and analysis <p>Energy efficiency in buildings:</p> <ul style="list-style-type: none"> • Building energy code analysis • Building energy management analysis • Building energy metering analysis • Building energy performance analysis • Building energy simulation analysis • Energy analysis of building envelope • Life cycle energy analysis <p>Fire services and security systems:</p> <ul style="list-style-type: none"> • Analysis of fire alarm and detection systems • Analysis of fire engineering approach • Analysis of fire sprinkler system • Analysis of smoke extraction system • Analysis of staircase pressurization system • Escape and emergency evacuation analysis • Fire response analysis • Fire risk/hazard analysis • Security design and risk analysis 	<p>Green and sustainable building:</p> <ul style="list-style-type: none"> • Carbon analysis • Green building assessment analysis • Green roof design and analysis • Life cycle analysis • Life cycle cost analysis • Passive design strategy analysis • Solar photovoltaic system analysis • Solar hot water system analysis • Sustainability analysis • Wind energy system analysis <p>HVAC systems:</p> <ul style="list-style-type: none"> • Building thermal load analysis • Building energy analysis • Heat recovery system analysis • HVAC control analysis • HVAC system performance analysis • Indoor airflow analysis • Indoor air quality analysis • Passive systems integration analysis • Thermal comfort analysis • Ventilation system analysis <p>Lighting systems:</p> <ul style="list-style-type: none"> • Daylighting analysis • Indoor lighting analysis • Lighting energy and cost analysis • Outdoor lighting analysis <p>Plumbing and drainage systems:</p> <ul style="list-style-type: none"> • Analysis of building drainage vent systems • Analysis of hot water system • Plumbing system analysis • Rainwater harvesting system analysis • Siphonic roof drainage system analysis • Water demand and consumption analysis <p>Vertical transportation systems:</p> <ul style="list-style-type: none"> • Analysis of lift energy consumption • Lift traffic simulation analysis • Lift system analysis • Performance analysis of lift systems
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3. Assessment Methods

The assessment in Semester 2 constitutes 50% of the total course marks and will be based on the following components:

Semester 2 oral presentation (10 min. presentation + 5 min. Q&A) = 10 marks

Semester 2 technical report (max. 100 nos. A4 pages including everything) = 40 marks

Submissions of reports should be punctual. Late submission may receive reduction in marks. Assessment of the study results is based on the following criteria: (a) object and methodology, (b) working attitude, (c) creativity, (d) achievement, (e) written report and (f) oral presentation.

4. Useful Guidelines

- (a) Select or propose a topic:

Generating ideas & forming a question (University of Reading)
http://www.mech.hku.hk/bse/capstone/A5_Dissertations_1.pdf

- (b) Literature review and study:

How to undertake a literature search and review: for dissertations and final year projects (DMU)
<http://www.mech.hku.hk/bse/capstone/LiteratureSearch.pdf>

Literature Review: Academic Tip Sheet (Edith Cowan University)
http://www.mech.hku.hk/bse/capstone/literature_review.pdf

- (c) Referencing:

Referencing: Why, when and how (Lincoln University)
http://www.mech.hku.hk/bse/capstone/Referencing_why_when_how_2008.pdf

- (d) Report organisation and planning:

Features of good reports (University of Reading)
http://www.mech.hku.hk/bse/capstone/A5_Reports_1.pdf

Structuring your report (University of Reading)
http://www.mech.hku.hk/bse/capstone/A5_Reports_2.pdf

- (e) Report writing:

Writing a research report (RMIT)
http://www.mech.hku.hk/bse/capstone/research_report.pdf

Writing critically (Lincoln University)
http://www.mech.hku.hk/bse/capstone/writing_critically_2008.pdf

- (f) Oral presentation:

Oral presentations (RMIT)
http://www.mech.hku.hk/bse/capstone/oral_presentations.pdf

Schedule of Activities 2014-2015

Semester 2: Technical Analysis

Monday 14:30-17:30, Venue: LG1-09, Composite Building (for the first three weeks)

Venue for week no. 4 to 13 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"> • 15:30-17:00 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 & 15-Apr-2015	Semester 2 Presentation <ul style="list-style-type: none"> • 13-Apr-2015 (Mon) 14:30-17:30 Oral presentations • 15-Apr-2015 (Wed) 09:30-12:30 Oral presentations
	14	20-Apr-2015	Deadline for submitting Semester 2 Report