

# SPD5141 Building Services System Design

<http://ibse.hk/SPD5141/>



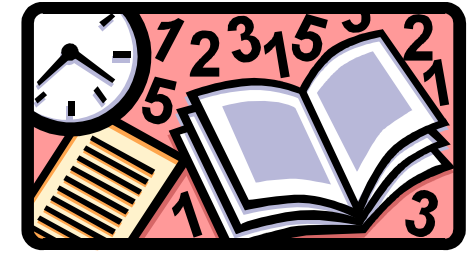
## Introduction



*Ir. Dr. Sam C. M. Hui*  
Faculty of Science and Technology  
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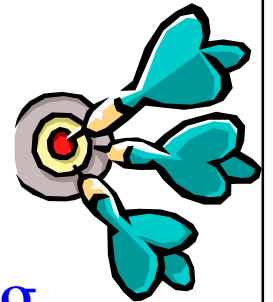
Mar 2017

# Course information

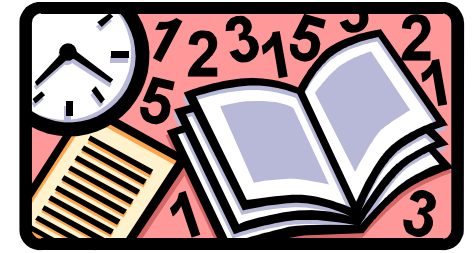


- Module Aim(s):

- Providing students with opportunity to develop practical design solutions of **integrative building service problems**, which include the considerations of the HVAC, electrical services, plumbing and piped services, fire services, IAQ and indoor noise aspects of typical commercial buildings in Hong Kong. Considerations will be given to the aspects in ensuring safety, health, comfort, economic, energy efficiency, legislative and sustainability issues commonly encountered for contemporary building design.



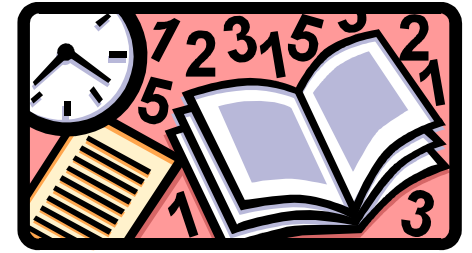
# Course information



## • Learning Outcomes:

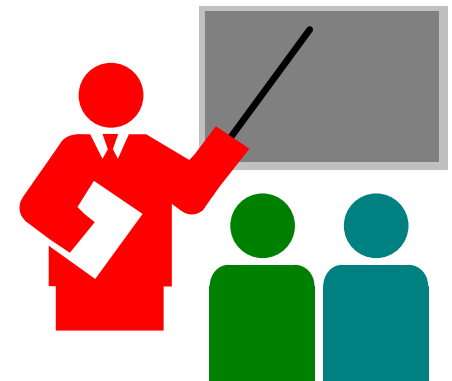
- 1. apply the **integrative** knowledge and engineering methods in the design of HVAC, piped and fire services of a typical floor of a commercial building with consideration of aspects such as comfort, health, safety and environment;
- 2. conduct indoor air quality and noise assessment for the design floor and prepare appropriate engineering solutions with consideration of design aspects such as safety, health, legislation and sustainability issues; and
- 3. design electrical services' systems for a typical floor of commercial building by integrating the knowledge concerning electrical services system, such as load estimation, protective devices and cable sizing with consideration of safety, health, legislation and sustainability issues.



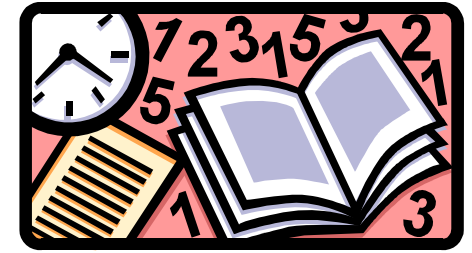


# Course information

- Lecturers (Design Tutors):
  - Ir. Dr. Sam C. M. Hui [cmhui@vtc.edu.hk]
  - Prof. K. P. Cheung [kpcheung@vtc.edu.hk]
  - Dr. TSANG Kin Wai, Ernest [ernest\_tsang@vtc.edu.hk]
- Assessment Methods:
  - Design Project (80%)
  - Presentation (20%)
- Course Website:
  - <http://ibse.hk/SPD5141/>
- Classroom: Room 811, THEi TY

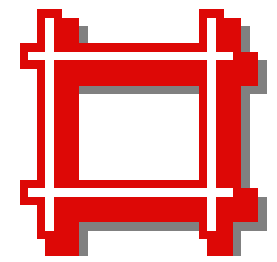


# Course information



- Main Activities:

- 10-Mar-2017 (Fri) Introduction and Student Grouping
- 17-Mar-2017 (Fri) Design Seminar: Green Building Design/Assessment
- 24-Mar-2017 (Fri) Design Seminar: Building Services Design Guides
- 28-Apr-2017 (Fri) Design Review and Tutorials
- 5-May-2017 (Fri) Interim Review (oral presentation + report submission)
- 16-Jun-2017 (Fri) Design Review and Tutorials
- 14-Jul-2017 (Fri) Final Presentation (oral presentation + report submission)



# Project brief

- Main theme for this year:
  - Renovation and Upgrade of THEi Building at Tsing Yi Campus
- Purpose and Scope of the Project:
  - To investigate/explore possible options and develop the technical design of Building Services systems for the renovation and upgrade of THEi Building at Tsing Yi Campus
  - Should demonstrate good practices in sustainable and energy efficient design

Figure 1. Site and building location (2/F to 10/F with total 7,800 m<sup>2</sup> usable floor area)

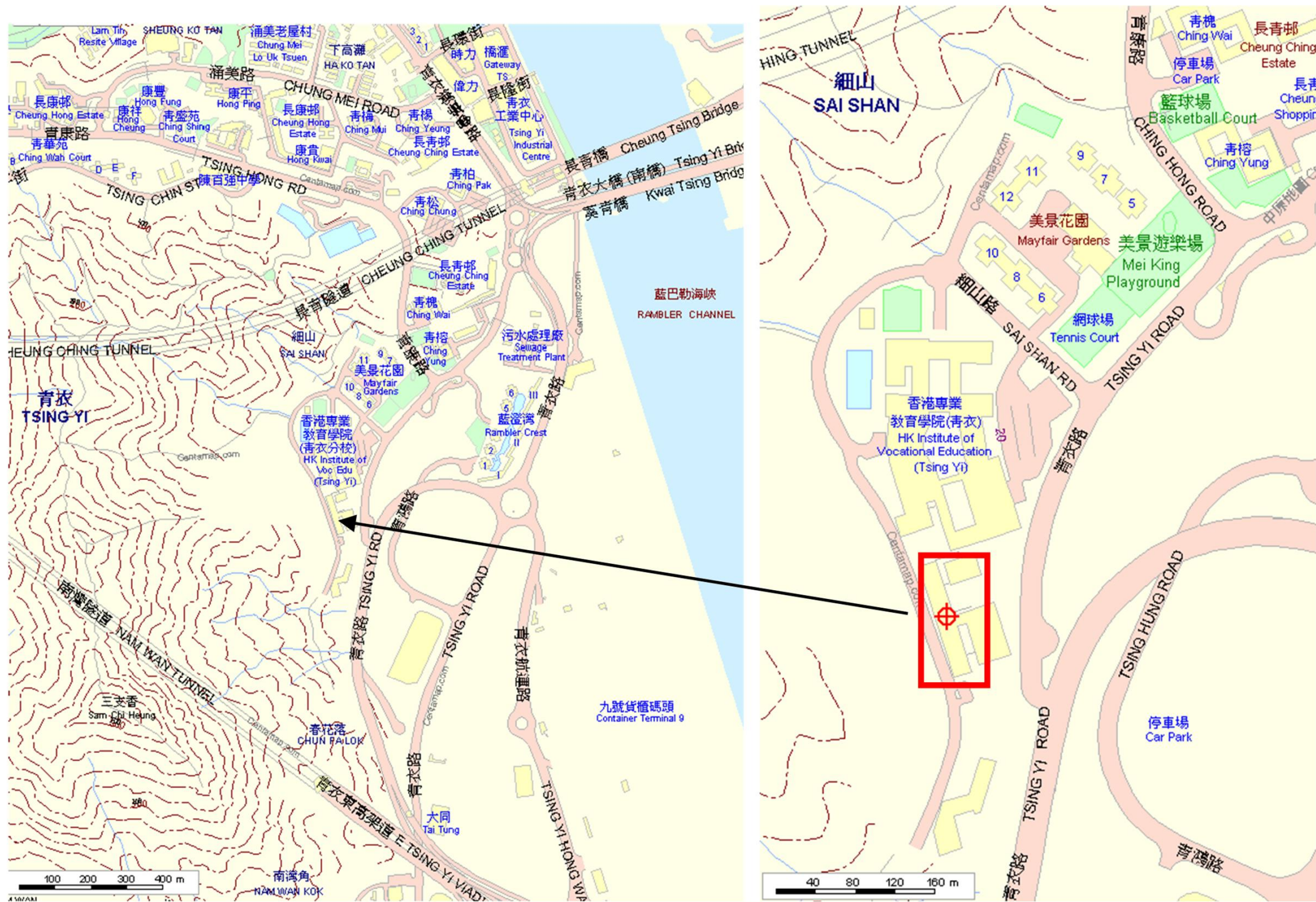


Figure 2. Photos of THEi Building



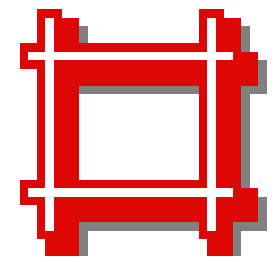


**Table 1. Proposed space requirements (total usable floor area = 7,800 m<sup>2</sup> for 2/F to 10/F)**

<b>Space</b>	<b>Area (m<sup>2</sup>)</b>	<b>Description</b>
Laboratories	3,000	For experiments, research projects and demonstrations
Classrooms	1,000	For teaching, examination and seminars
Staff offices	2,000	For academic, administrative and supporting staff
Computer rooms	1,000	For computer-aided learning and student working
Plant rooms	800	For the Building Services systems

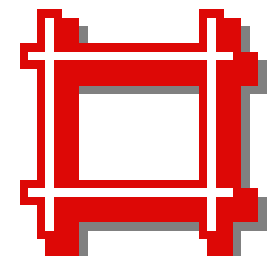
Major building services systems include:

- Heating, ventilating and air conditioning (HVAC)
- Fire services
- Plumbing and drainage
- Electrical services



# Project brief

- Initial estimate of the total cost for this project is **HK\$80 millions**
- Preliminary timeline for the project is **18 months** (it is expected that the construction work may commence in 2018)
- The design team might also propose some reasonable assumptions for the design and construction of the project (should be confirmed with the design tutors)



# Project brief

- Client Requirements
  - Effective and flexible spaces for use by the Faculty of Science and Technology and other related units of THEi
  - Scheduled for completion in the middle of 2019 (new academic year will start in September)
  - Design and construction of the project will follow the requirements of the BEAM Plus assessment method for new buildings and major renovations



HKGBC  
BEAM Plus  
綠建環評  
新建建築 1B

[Platinum – Gold – Silver – Bronze]



Site Aspects



Materials  
Aspects



Energy Use



Water Use

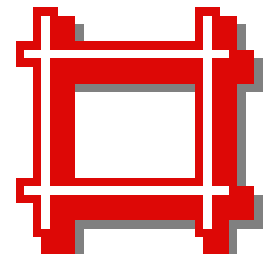


Indoor  
Environmental  
Quality



Innovations and  
Additions

# Project brief



- Design Process and Tasks
  - Students will form groups of 4 to 5 members to work as a team
  - Design process is divided into three main stages
    - (a) Appraisal
    - (b) Design Brief
    - (c) Concept



# Three main stages of the design process

## **(a) Appraisal**

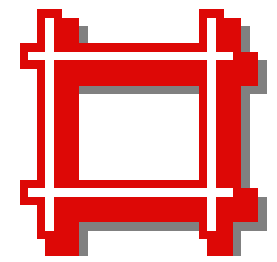
- Analysis of site environment
- Study of client requirements and objectives
- Evaluation of constraints, feasibility and options

## **(b) Design Brief**

- Confirmation of key requirements, criteria and scope
- Consideration of design strategies for building services systems
- Development of design brief and preparation for interim review

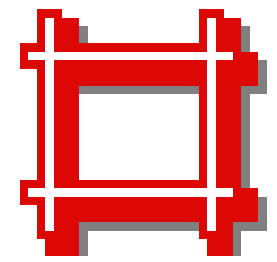
## **(c) Concept**

- Implementation of design brief and preparation of additional data
- Preparation of concept design (outline proposals, specifications, cost plan)
- Writing of design report and preparation for final presentation



# Project brief

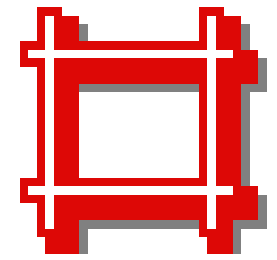
- Building design information:
  - Site conditions and environment (site access, circulation, surroundings, climate, etc.)
  - Architectural design drawings (site plan, floor plan, elevations, sections)
  - Building services design drawings and conceptual diagrams
  - System schematic diagrams
  - Plant room location and services distribution plans



# Project brief

- Building design information: (cont'd)
  - Conceptual utility connection diagrams
  - Conceptual zoning and coordination diagrams
  - Design requirements (the client, local regulations, authorities) and design criteria
  - Initial design calculations (load estimation and assessment, basic assumptions)
  - System descriptions and design concepts
  - Cost implications and project duration





# Project brief

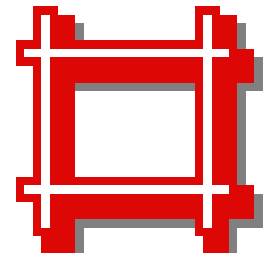
- Assessment Methods
  - (a) Presentations (20 marks)
    - Interim review oral presentation = 10 marks
    - Final presentation = 10 marks
  - (b) Design Reports (80 marks)
    - Interim report = 30 marks
    - Final report = 50 marks
- See also assessment rubrics

Useful References (on Building Services Design):  
(ebooks available at VTC Library through  
Construction Information Service (CIS) by IHS  
<http://eproxy.vtclib9.vtc.edu.hk:2048/login/CIS>)

- 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.
- Hall, F. and Greeno, R., 2013. *Building Services Handbook*, 7th ed., Butterworth-Heinemann, Oxford, U.K.
- 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.
- Pennycook, K., 2006. *Design Checks for Electrical Services*, Application Guide BG 3/2006, Building Services Research and Information Association, Bracknell, Berkshire, England.
- Pennycook, K., 2006. *Design Checks for Public Health Engineering*, Application Guide BG 2/2006, Building Services Research and Information Association, Bracknell, Berkshire, England.

\* See also the extracts of Building Services Design Process, Design Maps and Building Services Engineering Design Guidelines.

# Project brief



- Useful Websites:

- Resources (for the Building Services System Design)

<http://ibse.hk/SPD5141/resources.htm>

- Student Notes for Building Services Engineering

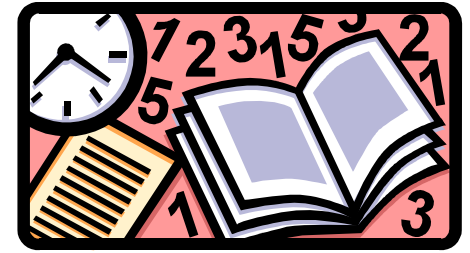
<http://www.arca53.dsl.pipex.com/>

- Sustainable Design for Buildings [ArchSD]

<http://www.archsd.gov.hk/archsd/html/teachingkits/TK1/>

- Whole Building Design Guide (WBDG) Sustainable

<http://www.wbdg.org/design/sustainable.php>



# Further Reading

- Building Services System Design – Assessment Rubrics
- Guidelines on Oral Presentation
- Guidelines on Design Report Writing
- Building Services Design Process + Design Maps (HVAC, Electrical Services, Public Health Engineering)
- Building Services Engineering Design Guidelines