ARCH 5731B
2014-15 2nd Term
Topical Studies in Urbanism – Performance-based Simulation in Design and Planning

(Last updated on 23 Jan 2015)

COURSE OUTLINE
Instructors: Prof. TSOU Jin Yeu / Prof. Benny CHOW
Venue: WFY402 / ITSC Training Room 107 (Pi Chiu)
Time: Tuesday 9:30am – 12:15pm / Tuesday 7:00pm to 9:45pm

COURSE DESCRIPTION
The course contents integrate the green building essentials, technical knowledge, assessment criteria and performance-based simulation techniques of green building development and sustainable urban design and planning. It helps to develop students' critical thinking and judgment in understanding various major impact categories covered by an international green building rating tool, Leadership in Energy & Environmental Design (LEED) developed by the U.S. Green Building Council (USGBC). The course also will provide dedicated office visit from the world top ranked architectural practice to demonstrate how the sustainable design knowledge and techniques learnt in the class can be applied and further developed in professional practice in real world setting. The tutorial exercises will serve as a testing base for students to apply various building simulation tools to test their environmental responsible concepts in high-density urban context. The design problem offers well-defined and constrained sets of performance requirements which represent important "what-if" scenarios encountered by designers. The advanced simulation is applied to conduct an “environmental audit” to identify the potential areas for design improvement. New architecture features will be experimented and simulated to improve the design quality.

OBJECTIVES
The principle objectives are to provide students an opportunity to establish in-depth understanding on performance based simulation theory, to gain hands-on knowledge on computational performance modeling, and to apply these techniques on investigating architectural design problems. This course aims to emphasize the following points:

1. Design and exploration based on design research courses through scientific approach.
2. Exercise about simulation techniques and applications on design and planning.
3. Design innovation and problem oriented design method.
4. Integrated architectural and engineering exploration responding environmental issues.
5. Exercise about simulation techniques.

LEARNING OUTCOME
1. Be familiar with an international green building rating tool available in the market;
2. To develop a systematic framework and broad knowledge on the overall implementation of green building / urban development.
3. To gain in-depth knowledge on the credit intents of each impact category and its requirements for green building and sustainable urban development;
4. To get hands-on knowledge and skills on the operations of various building performance simulation packages, including remote sensing, daylighting simulation and air ventilation assessment.

COURSE ASSESSMENT
1. Class Attendance and Participation: 10%
2. Workshop Assignments: 60%
   (Assignments: GIS / Daylighting Simulation / Urban Wind Simulation)
3. Final Examination: 30%
   (Format: Individual, Paper-based, 2 hours, MC with short questions)

COURSE STRUCTURE
Lecture by the instructor and guest lecturers will be conducted to introduce the various green building sustainable design concepts and building performance simulation skills for improving the environmental design. The workshop exercises will be conducted for allowing students to apply the environmental design by the computational simulation tools. Such as Geographic Information System (GIS), Remote Sensing (RS), Computational Fluid Dynamics (CFD) and Ecotect.

RECOMMENDED READINGS


**SCHEDULE**

Final Examination: 14 April, 2015 (6:30pm to 8:30pm)

**IMPORTANT NOTE TO STUDENTS:**

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at [http://www.cuhk.edu.hk/policy/academichonesty/](http://www.cuhk.edu.hk/policy/academichonesty/). With each assignment, students will be required to submit a statement that they are aware of these policies, regulations, guidelines and procedures.
### 6. Course Schedule (tentative)

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<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture &amp; Workshop</th>
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| 1    | Jan 6 | The Use of Simulation Technologies for Urban Sustainable Development  
(1) Urban Change and Environment Problems  
(2) Technology Overview | WFY402 (0930-1215) |
| 2    | Jan 13 | Course Overview of Building Performance Simulation  
(1) Green Building and Low-Carbon City  
(2) Case Studies | WFY402 (0930-1215) |
| 3    | Jan 20 | Green Building Integrative Process & System Thinking  
USGBC LEEDv4 Core Concept | WFY402 (1900-2145) |
| 4    | Jan 27 | 1. Location and Transportation  
2. Sustainable Sites | ITSC 107 (1900-2145) |
| 5    | Feb 3 | 3. Energy and Atmosphere  
4. Water Efficiency | ITSC 107 (1900-2145) |
| 6    | Feb 10 | Study Week | Exchange Square |
| 7    | Feb 17 | 5. Materials and Resources  
6. Indoor Environmental Quality | ITSC 107 (1900-2145) |
| 8    | Feb 25 (W) | Remote Sensing & Geographic Information System (I) | ITSC 107 (1900-2145) |
| 9    | Mar 3 | Remote Sensing & Geographic Information System (II) | ITSC 107 (1900-2145) |
| 10   | Mar 10 | **Daylighting Workshop (1)** – Inter-block shading and solar access hours in open space | ITSC 107 (1900-2145) |
| 11   | Mar 17 | **Daylighting Workshop (2)** – Solar heat gain analysis on building facades | ITSC 107 (1900-2145) |
| 12   | Mar 24 | Study Week | |
| 13   | Mar 31 | **Air Ventilation Assessment Workshop (1)**  
- Basic Principle, Creation of CFD Model | ITSC 107 (1900-2145) |
| 14   | Apr 8 (W) | **Air Ventilation Assessment Workshop (2)**  
- Meshing Techniques, Data Analysis and Interpretation | ITSC 107 (1900-2145) |
| 15   | Apr 14 | Final Examination  
(Paper-based, 2 hours, MC with Short Questions) | ITSC 107 (1900-2145) |