

# CA4174: SUSTAINABILITY AND BUILDING SYSTEMS INTEGRATION

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## Effective Term

Semester A 2022/23

## Part I Course Overview

### Course Title

Sustainability and Building Systems Integration

### Subject Code

CA - Civil and Architectural Engineering

### Course Number

4174

### Academic Unit

Architecture and Civil Engineering (CA)

### College/School

College of Engineering (EG)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

The course aims at developing student's understanding of the principles of sustainable design, and the strategies and technologies to improve the sustainability and performance of buildings in relation to environmental impact.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)			
1	Explain the concepts of sustainable development, building sustainability audits relevance to architecture.		x		
2	Identify the strategies of environmental sustainability and their applications in the design of buildings and their environmental control systems.			x	
3	Explore the practice of sustainable building design and construction, including the design of building services systems to enhance environmental control in buildings.			x	
4	Comprehend the implementation of various assessment tools for green buildings and its effect on building systems integration design.			x	

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Explain the key principles, theories and standards for Sustainable Architectural Design and Development.	1, 2, 3, 4

2	Tutorial	Activity complementary to the lecture classes to provide more opportunities for student-instructor and student-student interaction. Students will be engaged in more detailed discussions on the lecture materials and/or assessment tasks in a tutorial.	3, 4	
3	Seminar	Consists of oral presentations by instructors and/or external guests, which focuses on a selected topic relating to the integrated studio or the various subject area courses.	2, 4	

**Assessment Tasks / Activities (ATs)**

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3, 4	60	
2	Mid-term test	1, 2	20	

**Continuous Assessment (%)**

80

**Examination (%)**

20

**Examination Duration (Hours)**

1.5

**Additional Information for ATs**

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%.

**Assessment Rubrics (AR)****Assessment Task**

Assignments

**Criterion**

1.1 Thorough explanation on the concepts of sustainable development, building sustainability and its relevance to architecture.

1.2 Ability to identify the strategies of environmental sustainability and their applications in the design of buildings and their environmental control systems.

1.3 Thorough exploration of the practice of sustainable building design and construction; and skilful incorporation of the design of building services systems to enhance environmental control in buildings.

1.4 Thorough comprehension of the implementation of various assessment tools for green buildings and its effect on building systems integration design.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

Mid-term test

**Criterion**

2.1 Thorough explanation on the concepts of sustainable development, building sustainability and its relevance to architecture.

2.2 Ability to identify the strategies of environmental sustainability and their applications in the design of buildings and their environmental control systems.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

Examination

**Criterion**

3.1 Thorough exploration of the practice of sustainable building design and construction; and understanding on the design of building services systems to enhance environmental control in buildings.

3.2 Thorough comprehension of the implementation of various assessment tools for green buildings and its effect on building systems integration design.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

## Part III Other Information

### Keyword Syllabus

- Principles of building sustainability: sustainable development; environmental sustainability; carbon footprint; energy efficiency; urban heat island; bio-diversity; embodied energy; renewable/regional materials; recycling; adaptive reuse; indoor environmental quality; material and water conservation.
- Assessments: air ventilation assessment; OTTV; life cycle cost and assessment; green building assessment.
- Building services: Types and systems; plant requirement and primary sizing; plant arrangement and space planning implications; services coordination; innovative building systems for sustainability.
- Intelligent buildings: Concept of intelligent buildings; energy efficiency; vertical transportation systems; communication systems; security systems; building automation and lighting systems.

### Reading List

#### Compulsory Readings

Title	
1	Nil

#### Additional Readings

Title	
1	Bauer, M., Möhle, P. and Schwarz, M. (2009) Green building: Guidebook for sustainable architecture, New York: Springer, 2009.
2	Berge, B. (2001) The ecology of building materials, Oxford: Architectural Press.
3	Drake, S. (2007) The third skin: Architecture, technology and environment, New South Wales: UNSW Press.
4	Feireiss, K. and Feireiss, L. (2008) Architecture of change: Sustainability and humanity in the built environment, Berlin: Gestalten.
5	Hong Kong Green Building Council (2011) "Hong Kong report on the state of sustainable building 2011", World Sustainable Building Conference 2011, Helsinki, Finland.
6	Kibert, C. J. (2007) Sustainable construction: Green building design and delivery, 2nd Edition, Hoboken: Wiley.
7	Kwok, A. and Grondzik, W. (2007) The green studio handbook: Environmental strategies for schematic design, Burlington: Architectural Press.
8	Steele, J. (1997) Sustainable architecture: Principles, paradigms, and case studies, New York: McGraw.
9	Williams, D. E. (2007) Sustainable design: Ecology, architecture, and planning, Hoboken: Wiley.
10	Code of Practice for Overall Thermal Transfer Value in Buildings 1995, Hong Kong: Building Authority.

11	PNAP on OTTV <a href="https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/APP/APP156.pdf">https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/APP/APP156.pdf</a>
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