

**City University of Hong Kong
Course Syllabus**

**offered Division of Building Science & Technology
with effect from Semester B 2018/19**

Part I Course Overview

Course Title:	HVAC Services 1
Course Code:	BST22531
Course Duration:	1 semester
Credit Units:	3 credits
Level:	A2
Proposed Area: <i>(for GE courses only)</i>	<input type="checkbox"/> Arts and Humanities <input type="checkbox"/> Study of Societies, Social and Business Organisations <input type="checkbox"/> Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: <i>(Course Code and Title)</i>	Nil
Precursors: <i>(Course Code and Title)</i>	BST12511 Thermal Science BST12512 Fluid Science
Equivalent Courses: <i>(Course Code and Title)</i>	BST21531 HVAC Services 1
Exclusive Courses: <i>(Course Code and Title)</i>	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to provide students with the working principles of basic mechanical ventilation and air-conditioning systems, and their characteristics, performances and design criteria.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs [#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Explain the working principles of mechanical ventilation and air distribution systems, their equipment constructions and operation characteristics.	25%	✓	✓	
2.	Explain the working principles of single- and multi-zone air-conditioning systems, their equipment constructions, and operation characteristics.	25%	✓	✓	
3.	Perform flow analysis of fan-duct systems with diagrams and graphs.	16%		✓	✓
4.	Perform air-conditioning cycle analysis of single-zone air-conditioning systems with diagrams and psychrometric chart.	16%		✓	✓
5.	Perform air-conditioning cycle analysis of common multi-zone air-conditioning systems with diagrams and psychrometric chart.	18%		✓	✓
		100%			

* If weighting is assigned to CILOs, they should add up to 100%.

Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 self-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.

3. Teaching and Learning Activities (TLAs)
(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lecture (normal class size not more than 100 students)	Explain the working principles of mechanical ventilation and air distribution systems, single- and multi-zone air-conditioning systems, their equipment constructions, operation characteristics, and design criteria.	✓	✓	✓	✓	✓	2 hrs/wk
Tutorial/ Test (normal class size not more than 40 students)	Assess the student understanding of the relevant taught topics. It is a combination of case problems and/or calculation exercises for guided students learning.	✓	✓	✓	✓	✓	1hr/wk

4. Assessment Tasks/Activities (ATs)
(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4	5		
Continuous Assessment: <u>40%</u>							
Test / Assignment	✓	✓	✓	✓	✓	40%	
Examination: <u>60%</u> (duration: 2.5 hours)							
Examination	✓	✓	✓	✓	✓	60%	
* The weightings should add up to 100%.						100%	

Note: A student must obtain a minimum mark of 35 in both coursework and examination and an overall mark of 40 to pass the course

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Test / Assignment	Ability to explain the working principles of mechanical ventilation and air distribution systems, and their equipment constructions and operation characteristics.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Test / Assignment	Ability to explain the working principle of single- and multi-zone air-conditioning systems, and their equipment constructions and operation characteristics.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

Psychrometry: thermodynamic properties of air; psychrometric chart; psychrometric processes.

Cooling load calculation: basic principles and methods; data assembly; heat gains.

Air-ducts: construction; fittings and friction losses; fan types and performance; methods to modulate fan capacity; combined fan-duct system; series and parallel operation; contaminants and air filtration; mechanical ventilation: supply, extract, and balance systems.

Air-conditioning processes: heating and cooling coils; contact factor and by-pass factor; humidifiers and applications; all-air, all-water and air-water systems; single zone constant volume air-conditioning system; multi-zone air-conditioning; CAV, VAV, fan coil systems; free-air cooling; simple operation modes and control schemes.

Space air distribution: types of diffusers and characteristics; air flow patterns.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	ASHRAE Handbooks: Fundamentals, Refrigeration, HVAC Systems and Equipment, HVAC Applications, latest version.
2.	CIBSE Handbooks, latest version.

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Wang, S. K. (2001). <i>Handbook of Air Conditioning and Refrigeration</i> . 2nd ed. McGraw-Hill.
2.	Eastop, T D & Watson, W E (1992). <i>Mechanical Services for Buildings</i> . Longman.
3.	McQuiston FC, Parker JD, Spitler JD (2005). <i>Heating, Ventilating, and Air-conditioning: Analysis and Design</i> . 6th ed. Wiley.
4.	Jones WP (2001). <i>Air Conditioning Engineering</i> . 5th ed. Oxford: Butterworth- Heinemann.
5.	Stoecker WF, Jones JW (1982). <i>Refrigeration and Air-conditioning</i> . McGraw Hill.