

**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 2
Course Code:	BST22532
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>	Nil
Equivalent Courses: <i>(Course Code and Title)</i>	Nil
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 refrigeration, hydronic systems, space heating, system control, test & commissioning and maintenance, and their characteristics, performances and design criteria in HVAC Services.

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 in relation to scientific principles the key components, control and operating principles, pros and cons of different refrigeration systems.		✓		
2.	apply the knowledge of technological science and air-conditioning engineering in analyzing the performances of common refrigeration systems.		✓		
3.	explain in relation to scientific principles the key components, control and operating principles, pros and cons of different hydronic systems and space heating.		✓		
4.	apply the knowledge of technological science and air-conditioning engineering in analyzing the performances of common hydronic systems and space heating		✓	✓	✓
5.	explain and apply the system control, testing & commissioning and maintenance from the perspective of HVAC systems.		✓	✓	
		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 (Around 100 students, splitting into two)	Explain the working principles of common refrigeration, different hydronic systems, space heating, system control, testing & commissioning and maintenance, and their characteristics, performances and design criteria in HVAC services.	✓	✓	✓	✓	✓	2 hours/week
Tutorial (Around 100 students, splitting into two)	Assess the student understanding of the relevant taught topics. It is a combination of case studies and/or calculation exercises for guided students learning.	✓	✓	✓	✓	✓	1 hour/week
Coursework Assignments	To facilitate students' active learning of the knowledge and their applications for solving real-life problems. Students are required to complete coursework assignments. These include independent exercises and/or a group project. They do not only help promote students' critical thinking, but also their independent learning skills.	✓	✓	✓	✓	✓	
Quizzes	Quizzes will be arranged to evaluate student's understanding of the concept of the taught topics.			✓	✓	✓	
Examination	Examination will be arranged to evaluate students' understanding and ability to apply subject-related knowledge learned from the lectures, tutorials and required reading materials.	✓	✓	✓	✓	✓	

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>							
Quizzes / Coursework Assignments	✓	✓	✓	✓	✓	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. Quizzes	ABILITY to explain the key components, working principles of hydronic systems, space heating, system control, and their characteristics, performances, design criteria, system control and the necessary works from the perspective of HVAC systems.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Coursework Assignments	QUALITY of submission in conciseness, clarify, consistency, completeness of data and content, proper use of tables, figures and reference. ABILITY to express an ideas in a logical order of written texts, calculations and graphical presentation.	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.)

1. **Refrigeration:** Refrigeration cycles; cycle performance; compressor: types, performance and capacity control; types and performance of condenser and evaporator; fins: construction and effectiveness; expansion devices: types and functions.
2. **Hydronic Systems:** Chilled water and hot water; classification and design principles; primary and secondary circuits: decoupler, differential pressure bypass; tall-building applications. cooling tower; sea water cooling systems; water treatment; expansion tank.
3. **Space Heating:** Space heating systems and equipment.
4. **System Control:** Control purposes and basic elements; power sources: electric/electronic, pneumatic and self-powered; control actions and stability; DDC; control equipment: sensor, controller, control valves and dampers; practical applications in HVAC systems.
5. **Testing & commissioning and Maintenance:** Testing & commissioning and Maintenance of airside and waterside systems.

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: <i>Fundamentals, Refrigeration, HVAC Systems and Equipment, HVAC Applications</i> , latest version.
2.	<i>Code of practices for energy efficiency and energy audit issued by Electrical and Mechanical Services Department, Hong Kong Government</i> , latest version.
3.	<i>CIBSE Handbooks</i> , 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.