

CA3722: HVAC ENGINEERING

Effective Term

Semester A 2022/23

Part I Course Overview

Course Title

HVAC Engineering

Subject Code

CA - Civil and Architectural Engineering

Course Number

3722

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

For ARCE Major: CA2626 Thermal Engineering for Building Engineers and CA2627 Building Science and CA2123 Engineering Methods. For other students: CA2627 Building Science or SEE2101 Engineering Thermofluids I. Students must have attempted (including class attendance, coursework submission, and examination) the precursor course(s) so identified.

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

The course aims to provide descriptions of essential knowledge and the practical aspects of heating, ventilating, air-conditioning and refrigeration systems and to prepare for taking the HVAC engineering electives.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1 apply psychrometric analysis to determine the operating conditions of secondary air-conditioning systems;		x	x	x
2 discover the refrigeration cycle performance through investigation of heat and work transfer characteristics of the basic components in refrigeration systems.;			x	x
3 analyse the ventilation requirements and apply hydronic calculation methods to design fan-duct systems in buildings; and			x	x
4 list HVAC automatic control system configurations and discuss the considerations that lead to selection of control algorithms.		x	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	On topics related to heating, ventilation and air conditioning.	1, 2, 3, 4	
2 Tutorial	In class discussions and activities on problems related to lecture themes.	1, 2, 3, 4	
3 Laboratory	Carry out laboratory related to the lectures.	1, 3	

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Mid-term Test	1, 2, 3, 4	30	Two tests
2	Laboratory report	1, 3	20	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

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**

Mid-term Test

Criterion

ABILITY to UNDERSTAND and APPLY theories and knowledge to topics related to heating, ventilation and air conditioning.

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

Assessment Task

Laboratory report

Criterion

ABILITY to APPLY theories and knowledge to explain and analyze experimental phenomenon and data.

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

Assessment Task

Examination

Criterion

ABILITY to UNDERSTAND and APPLY theories and knowledge to topics related to heating, ventilation and air conditioning.

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**

Air-conditioning cycles and systems. Ventilation systems. Hydronic systems. Refrigeration systems. Compressor, Evaporator, Condenser, Expansion devices, Automatic control configurations. Commissioning, operation and maintenance. Fan-duct system.

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	Eastop, T.D. & Watson, W.E. (1992), Mechanical Services for Buildings, Longman, England. (TH3010.E27 1992)
2	Langley, B.C. (1985), Control Systems for Air Conditioning and Refrigeration, Prentice-Hall, N.J. (TH7687.5.L364)
3	Jones, W.P. (2001), Air Conditioning Engineering, Butterworth-Heinemann, Oxford. (TH7687.J663 2001)
4	Harris, N.C. (1990), Modern Air Conditioning Practice, McGraw-Hill, N.Y. (TH7687.H25 1990)

5	Martin, P.L. & Oughton, D.R. (2002), Faber & Kell's Heating and Air-conditioning of Buildings, 9th ed. Butterworth-Heinemann, Oxford. (TH7222.F3 2002)
6	McQuiston, F.C., Parker, J.D. & Spltler, J.D. (2005) Heating, Ventilating and Air Conditioning: Analysis & Design, 6th ed. John Wiley & Sons, N.J. (TH7222.M32 2005)
7	Levenhagen, J.I. & Spethmann, D.H.(1993), HVAC Controls and Systems, McGraw-Hill, N.Y. (TH7466.5.L48 1993)
8	Wang, S.K. (2001), Handbook of Air Conditioning and Refrigeration, 2nd ed. McGraw-Hill, N.Y. (TH7587.W27 2001)
9	American Society of Heating Refrigerating & Air-conditioning Engineers (ASHRAE), (latest edition), ASHRAE Handbook - Refrigeration. ASHRAE, Atlanta, GA. (TH7201. A78)
10	American Society of Heating Refrigerating & Air-conditioning Engineers (ASHRAE), (latest edition), ASHRAE Handbook - HVAC Applications. ASHRAE, Atlanta, GA. (TH7225 .A15)
11	American Society of Heating Refrigerating & Air-conditioning Engineers (ASHRAE), (latest edition), ASHRAE Handbook - HVAC Systems and Equipment. ASHRAE, Atlanta, GA. (TH7005 .A827)
12	American Society of Heating Refrigerating & Air-conditioning Engineers (ASHRAE), (latest edition), ASHRAE Handbook - Fundamentals. ASHRAE, Atlanta, GA. (TH7011 .A825)
13	American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), 2007. ASHRAE. [online] Available at [Accessed 20 March 2012].
14	The Chartered Institution of Building Services Engineering (CIBSE), 2012. CIBSE. [online] Available at:< http://www.cibse.org >[Accessed 20 March 2012].
15	The Hong Kong Institution of Engineers, 2012. The Hong Kong Institution of Engineers. [online] Available at: [Accessed 20 March 2012].
16	The Government of the Hong Kong Special Administrative Region, 2008. Electrical and Mechanical Services Department. [online] Available at: < http://www.emsd.gov.hk > [Accessed 20 March 2012].