

CA3722: HVAC ENGINEERING

Effective Term

Semester A 2025/26

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 is structured to engage students with essential knowledge and practical insights into heating, ventilation, and air-conditioning (HVAC) systems. It encourages active participation and aims to equip students with the foundational understanding necessary to tackle advanced HVAC engineering problems. Throughout the course, students will actively participate in discussions, engage with real-world applications, and explain complex concepts to reinforce learning.

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	Assess and explain 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	Explain HVAC automatic control 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.

Learning and Teaching Activities (LTAs)

LTAs		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 ("- for nil entry)	Allow Use of GenAI?
1	Mid-term Test	1, 2, 3, 4	30		No
2	Laboratory report	1, 3	20		Yes

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

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, OTTV, Ventilation systems, Hydronic systems, Refrigeration systems, Fan-duct system, Heating and cooling coils, Heat rejection, Optimal control.

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].