# CA3722: HVAC ENGINEERING

Effective Term Semester A 2024/25

## 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

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

## 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.

	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	

#### Learning and Teaching Activities (LTAs)

#### Assessment Tasks / Activities (ATs)

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

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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].