

CA2626: THERMAL ENGINEERING FOR BUILDING ENGINEERS

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Thermal Engineering for Building Engineers

Subject Code

CA - Civil and Architectural Engineering

Course Number

2626

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

Nil

Equivalent Courses

BC2626/BC2626F/BC2626P Thermal Engineering for Building Engineers

Exclusive Courses

Nil

Part II Course Details

Abstract

The course aims to provide fundamental knowledge of thermodynamics, heat transfer, fluid mechanics and dynamics as the foundation in the study of building services engineering and provide the thermofluid engineering theories in the study of refrigeration, flow of bodies and inside ducts and pipes.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 app.)		DEC-A2	DEC-A3
1	discover the cooling and heating effects through investigation of thermodynamic properties in the refrigeration cycles in air-conditioning systems;		x		
2	interpret and apply thermofluid engineering theories to solve basic psychometric problems in buildings;		x	x	
3	analyse heat transfer performance in building structures and building services pipelines; and			x	
4	apply the equations of fluid motion to solve a variety of fluid flows problems in ducts and pipes and over buildings.			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	Students will engage in lectures with facilitated discussions to gain key concepts in thermal engineering and its applications in architectural engineering systems.	1, 2, 3, 4	
2	Laboratory	Students will practise the concepts of thermal engineering and discover the deviations between the theories and experiments.	1, 2, 3, 4	

Assessment Tasks / Activities (ATs)

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

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

1. ABILITY to ANALYSE the heat transfer process and SOLVE fluid flow problems in pipes and ducts.

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

Coursework: Laboratory report

Criterion

1. ABILITY to DISCOVER and INTERPRET the thermodynamics properties and the basic psychometric problems in buildings

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

1. ABILITY to ANALYSE the heat transfer process and SOLVE fluid flow problems in pipes and ducts.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

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Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Fundamental laws of thermodynamics. Non-flow and steady flow energy equations. Reciprocating compression cycle. Basic heat transfer. Refrigeration cycle. Psychometric mixtures. Properties of Fluids. Viscosity. Laminar and Turbulent Fluid Flow. Boundary Layer. Basic Fluid Mechanics and Dynamics. Continuity, Momentum and Energy Equations for Fluid Flows and Air flow in ducts and pipes, as well as flow over buildings and structures.

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	Eastop, T.D. & McConkey, A. (1993), Applied Thermodynamics for Engineering Technologists, 5th ed. Longman, Essex, England. (TJ265.E23 1993)
2	Douglas, J.F., Gasiorek, J.M. & Swaffield, J.A. (2001), Fluid Mechanics, 4th ed. Prentice-Hall, Upper Saddle River, NJ. (TA357.D68 2001)

3	American Society of Heating, Refrigerating and Air-Conditioning Engineers (2005), ASHRAE Handbook: Fundamentals. (TH7201.A823 2005)
4	Jones, W.P. (2001), Air Conditioning Engineering, 5th ed. Butterworth-Heinemann, Oxford. (TH7687.J663 2001)
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	Kuehn, T.H., Ramsey, J.W. & Threlkeld, J.L. (1998), Thermal Environmental Engineering, 3rd ed. Prentice-Hall, Upper Saddle River, NJ. (TH7121.T39 1998)
7	Online Resources: American Society of Heating Refrigeration & Air-conditioning Engineers (ASHRAE) - http://www.ashrae.org