SEE2101: ENGINEERING THERMOFLUIDS I

Effective Term
Semester A 2023/24

Part I Course Overview

Course Title
Engineering Thermofluids I

Subject Code
SEE - School of Energy and Environment
Course Number
2101

Academic Unit
School of Energy and Environment (E2)

College/School
School of Energy and Environment (E2)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
PHY1201 General Physics I;
MA1200 Calculus and Basic Linear Algebra I or
MA1300 Enhanced Calculus and Linear Algebra I;
MA1201 Calculus and Basic Linear Algebra II or
MA1301 Enhanced Calculus and Linear Algebra II; AND
SEE1003 Introduction to Sustainable Energy and Environmental Engineering

Precursors
SEE2001 Electromagnetic Principles for Energy Engineers or equivalent; AND
MA2181 Mathematical Methods for Engineering

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The course aims to give students an introduction to the basic principles of thermodynamics, fluid mechanics and heat transfer. These basic principles will help the students build a strong foundation for further innovative studies of energy and environment applications.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic principles of thermodynamics, fluid mechanics and heat transfer.	50	x	x	
2	Apply the basic principles to study energy conversion and transfer in energy and environment engineering, and other related innovative applications.	30		x	
3	Apply the basic principles to evaluate the performance of energy cycles.	20		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	Lectures and Tutorials	Explain theories and concepts	1, 2, 3	
2	Tutorials	Apply theories and concepts on practical examples	1, 2, 3	
3	Lab-based experiment	Apply theories and concepts on hands-on experiments	1, 2, 3	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3	18	
2	Labs	1, 2, 3	12	
3	Quiz	1, 2, 3	20	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

Examination duration: 2 hrs
Percentage of coursework, examination, etc.: 50% by coursework; 50% by exam

To pass a course, a student must do ALL of the following:
1) obtain at least 30% of the total marks allocated towards coursework (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);
2) obtain at least 30% of the total marks allocated towards final examination (if applicable); and
3) meet the criteria listed in the section on Assessment Rubrics.

Assessment Rubrics (AR)

Assessment Task

1. Assignments

Criterion

Ability to analyse and solve problems related to thermodynamics, fluid mechanics and heat transfer for energy conversion

Excellent (A+, A, A-)

Excellent analysis and problem solving skills to demonstrate in-depth understanding of thermodynamics, fluid mechanics and heat transfer

Good (B+, B, B-)

Good analysis and problem solving skills to demonstrate good understanding of thermodynamics, fluid mechanics and heat transfer

Fair (C+, C, C-)

Acceptable analysis and problem solving skills to demonstrate adequate understanding of thermodynamics, fluid mechanics and heat transfer

Marginal (D)

Marginally acceptable analysis and problem solving skills to demonstrate some understanding of thermodynamics, fluid mechanics and heat transfer

Failure (F)

Poor analysis and problem solving skills and is barely able to demonstrate an understanding of thermodynamics, fluid mechanics and heat transfer

Assessment Task

2. Labs

Criterion

Ability to perform experiments related to thermodynamics, fluid mechanics and heat transfer for energy conversion

Excellent (A+, A, A-)

Excellent report writing and experimental skills with in-depth understanding of thermodynamics, fluid mechanics and heat transfer

Good (B+, B, B-)

Good report writing and experimental skills with good understanding of thermodynamics, fluid mechanics and heat transfer

Fair (C+, C, C-)

Acceptable report writing and experimental skills with adequate understanding of thermodynamics, fluid mechanics and heat transfer

Marginal (D)

Marginally acceptable report writing and experimental skills with some understanding of thermodynamics, fluid mechanics and heat transfer

Failure (F)

Poor report writing and experimental skills with poor understanding of thermodynamics, fluid mechanics and heat transfer

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Assessment Task

3. Quiz

Criterion

Ability to analyse and solve problems related to thermodynamics, fluid mechanics and heat transfer for energy conversion

Excellent (A+, A, A-)

Excellent analysis and problem solving skills to demonstrate in-depth understanding of thermodynamics, fluid mechanics and heat transfer

Good (B+, B, B-)

Good analysis and problem solving skills to demonstrate good understanding of thermodynamics, fluid mechanics and heat transfer

Fair (C+, C, C-)

Acceptable analysis and problem solving skills to demonstrate adequate understanding of thermodynamics, fluid mechanics and heat transfer

Marginal (D)

Marginally acceptable analysis and problem solving skills to demonstrate some understanding of thermodynamics, fluid mechanics and heat transfer

Failure (F)

Poor analysis and problem solving skills and is barely able to demonstrate an understanding of thermodynamics, fluid mechanics and heat transfer

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Assessment Task

4. Examination

Criterion

Ability to analyse and solve problems related to thermodynamics, fluid mechanics and heat transfer for energy conversion

Excellent (A+, A, A-)

Excellent analysis and problem solving skills to demonstrate in-depth understanding of thermodynamics, fluid mechanics and heat transfer

Good (B+, B, B-)

Good analysis and problem solving skills to demonstrate good understanding of thermodynamics, fluid mechanics and heat transfer

Fair (C+, C, C-)

Acceptable analysis and problem solving skills to demonstrate adequate understanding of thermodynamics, fluid mechanics and heat transfer

Marginal (D)

Marginally acceptable analysis and problem solving skills to demonstrate some understanding of thermodynamics, fluid mechanics and heat transfer

Failure (F)

Poor analysis and problem solving skills and is barely able to demonstrate an understanding of thermodynamics, fluid mechanics and heat transfer

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Part III Other Information

Keyword Syllabus

First law of thermodynamics; Second law of thermodynamics; Enthalpy; Entropy; Phase equilibrium; Carnot cycle; Refrigeration cycle; Heat pump; Steam turbines; Power cycles; Continuity equation; Bernoulli's equation; Potential flow; Laminar flow; Turbulent flow; Internal flow; External flow; Conductive, convective and radiative heat transfer.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Cengel, Y.A., Cimbala, J.M., Ghajar, A.J. Fundamentals of Thermal-Fluid Sciences, 6th edition, McGraw-Hill, 2021.
2	Bruce Munson, Donald F. Young, Theodore H. Okiishi, Fundamentals of Fluid Mechanics, 5th ed., Wiley, 2006.