

MNE6113: ADVANCED THERMO-FLUID

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Advanced Thermo-fluid

Subject Code

MNE - Mechanical Engineering

Course Number

6113

Academic Unit

Mechanical Engineering (MNE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

MNE8111 Advanced Thermal-fluid

Exclusive Courses

Nil

Part II Course Details

Abstract

Fluid flow and heat transfer widely occur in engineering processes, and they can be in multiphase forms, i.e., nano/micro or macro. As technologies rapidly evolve, advanced fluids such as nanofluids and supercritical fluids are more and more widely

applied in different engineering areas. The course aims to polish the knowledge of multiphase fluid flow and heat transfer to graduate students majoring in mechanical engineering and encourage them to apply the principles and theories to their research and practices. The topics cover fluid mechanics and heat transfer for different fluid types, including single-phase fluid and two-phase flow.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe and explain the basic principles and theories of fluid mechanics and heat transfer for multiscale thermofluid.	x	x	
2	Identify multiscale thermo-fluid related to mechanical engineering problems.		x	
3	Model and analyze multiphase thermo-fluid related to mechanical engineering problems with theories.		x	x
4	Demonstrate the critical thinking in the design of novel thermo-fluid systems.		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	Take place in classroom setting which consist of lectures on different topics of multiphase thermo-fluid	1, 2, 3, 4	2 hrs/week for 13 weeks
2	Tutorial	Take place in classroom setting which consist of tutorials and student activities on different topics of multiphase thermo-fluid	1, 2, 3, 4	1 hr/week for 13 weeks
3	Mid-term quiz	Take place in a classroom to assess the learning outcome	1, 2, 3, 4	2 hr/week for 6 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- for nil entry)	Allow Use of GenAI?
1	Test/Assignments	1, 2, 3, 4	10	-	Yes
2	Mid-term quiz	1, 2, 3	30	-	No

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

Assessment Rubrics (AR)**Assessment Task**

Test/Assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to understand basic concepts related with the instrumentation and testing technologies

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

Mid-term quiz (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to understand basic concepts related with the instrumentation and testing technologies.

Excellent

(A+, A, A-) High

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Assessment Task

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(F) Not even reaching marginal levels

Assessment Task

Test/Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to understand basic concepts related with the instrumentation and testing technologies

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task

Mid-term quiz (for students admitted from Semester A 2022/23 to Summer Term 2024)

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Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

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Part III Other Information

Keyword Syllabus

- Single-phase fluid mechanics
- Single-phase heat transfer
- Two-phase flow dynamics
- Two-phase heat transfer

Reading List**Compulsory Readings**

	Title
1	Fox, R. W., McDonald, A. T., Pritchard, P. J., Introduction to Fluid Mechanics, 6th Edition. John Wiley and Sons, 2006. ISBN: 0471735582.

2	Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt., Fundamentals of Heat and Mass Transfer, 7th edition. John Wiley and Sons, 2011. ISBN: 978-0-470-50197-9.
3	Yadigaroglu, G., Hewitt, G. F., Introduction to Multiphase Flow. Springer, 2018. ISBN 9783319587172.

Additional Readings

	Title
1	Ishii, M., Hibiki, T., Thermo-Fluid Dynamics of Two-Phase Flow, 2nd Edition. Springer, 2010. ISBN 9781441979858.
2	Todreas N. E., and Kazimi M. S. Nuclear Systems I: Thermal Hydraulic Fundamentals. Taylor & Francis Group, LLC, Second Edition. 2011. ISBN: 9781439808870.
3	Collier, J. G., and J. R. Thome. Convective Boiling and Condensation. 3rd ed. Oxford University Press, 1996. ISBN: 9780198562962.
4	Shah, M. M., Two-phase Heat Transfer. 2021, Wiley, ISBN 9781119618676.