MNE3122: FLUID MECHANICS

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Fluid Mechanics

Subject Code
MNE - Mechanical Engineering
Course Number
3122

Academic Unit
Mechanical Engineering (MNE)

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
MBE2003/MNE2003 Mechanics or MBE2109/MNE2109/BME2109 Engineering Mechanics

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Additional Information
#Prerequisites which are not part of the Major Requirement are waived for students admitted with Advanced Standing.

Part II Course Details

Abstract

Fluid mechanics is applied in a wide spectrum of practical applications ranging from micro-fluidic systems to large aerospace crafts. It is challenging since fluid mechanics requires more proper analysis of a problem than direct application of equations. Students must first assess the problem, make and justify appropriate assumptions and simplifications, identify suitable concepts and apply them to formulate the proper solutions. The course aims to lay down the basic principles and governing equations of fluid mechanics, and demonstrate their applications in engineering practice with real-word engineering examples.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic principles and governing equations of fluid mechanics.			x	
2	Solve fluid mechanics problems using given principles.			x	
3	Apply relevant principles to obtain solutions for fluid mechanics problems.			x	
4	Interpret the experimental results obtained in laboratory sessions to realize the application of fluid mechanics in real life problems.			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	Lecture	Explain key concepts, principles, theories of fluid mechanics and their applications.Provide room to clarify doubts that would enhance the understanding of the subject.	1, 2, 3	3 hrs for 13 weeks

2	Laboratory Work	Investigate concepts through hand-on experiments; acquire skills in handling of apparatus and in engineering report write up; promote active participation	1, 2, 3, 4	3 hrs for 3 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests and Assignments	1, 2, 3	25	Two test(s) and three assignments
2	Laboratory Reports	1, 2, 3, 4	15	3 reports to be submitted

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

3

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

Tests and Assignments

Criterion

1.1 Capacity for understanding the key concepts, principles and theories of fluid mechanics.
1.2 Ability to analyse and solve related engineering problems.

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 Reports

Criterion

2.1 Capacity for self-learning to understand the principles of fluid mechanics through performing experiments by following instructions given.
2.2 Ability to analyse and present the results of experiments in the proper technical report format.

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

3.1 Ability to explain the basic principles and fundamental concepts of fluid mechanics.
3.2 Capacity for analysing and solving given problems using relevant and appropriate formulae.

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

Additional Information for AR

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

Part III Other Information

Keyword Syllabus

- Basic concepts and fluid properties
- Pressure and fluid statics
- Fluids in motion
- Integral forms of the fundamental laws
- Differential forms of the fundamental laws
- Dimensional analysis and modelling Internal flows
- External flows
- Compressible flow
- Open channel flow
- Flows in piping systems
- Introduction of turbomachinery
- Measurements in fluid mechanics
- Computational fluid dynamics

Reading List

Compulsory Readings

	Title
1	Potter M.C., Wiggert D.C., Ramadan B.H., Mechanics of fluid, SI ed., 5th ed., Cengage Learning, 2017, ISBN 9781305637610.
2	Cengel Y.A., Cimbala J.M., Fluid mechanics: Fundamentals and applications, 3rd ed., McGraw Hill, 2014, ISBN 9780073380322.

Additional Readings

	Title
1	Fox R.W., Pritchard P.J., McDonald A.T., Introduction to fluid mechanics, 7th ed., John Wiley & Sons, Inc., 2004, ISBN 9780471742999.
2	Potter M.C., Wiggert D.C., Schaum’ s outline of fluid mechanics, McGraw Hill, 2008, ISBN 9786611182335.
3	Young D.F., A brief introduction to fluid mechanics, 5th ed., J. Wiley, 2011, ISBN 9780470596791.
4	White F.M., Fluid mechanics, 7th ed., McGraw Hill, 2011, ISBN 9780077422417.