City University of Hong Kong
Course Syllabus

offered by
Department of Mechanical Engineering
with effect from Semester B 2019 / 2020

Part I Course Overview

Course Title:	Thermo and Fluid Dynamics
Course Code:	MNE2101
Course Duration:	1 semester
Credit Units:	3 credits
Level:	B2
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites[#]: *(Course Code and Title)*	AP1201/PHY1201 General Physics I
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	MBE2101 Thermo and Fluid Dynamics
Exclusive Courses: *(Course Code and Title)*	MNE2112 Thermodynamics or BME2122 Biological Thermofluids

[#]Prerequisites which are not part of the Major Requirement are waived for students admitted with Advanced Standing and for BME/BIE students with A/AS-level Physics, HKDSE Physics with Level 3 or above, or equivalent admitted with Advanced Standing.

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to provide students a holistic introduction to thermofluids by laying out the foundations of thermodynamics, fluid mechanics and heat transfer in a coherent and connected way. At the end of the course, the students will not only be able to do calculations and solve problems on separate subjects, but also understand in full detail how the subjects interrelate.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	**Describe** the basic principles of thermodynamics, fluid mechanics, and heat transfer.			√	
2.	**Select** relevant principles to obtain solutions for some common thermodynamics, fluid mechanics, and heat transfer problems.			√	
3.	**Integrate** the principles of thermodynamics, fluid mechanics and heat transfer to analyse some real life problems.			√	
4.	**Demonstrate** reflective practice in an engineering context.			√	
** If weighting is assigned to CILOs, they should add up to 100%.*		N.A.			

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture and Tutorial	Explain key concepts, principles, theories, and their applications related to thermodynamics, fluid mechanics and heat transfer.	✓	✓	✓		3 hrs/week
Laboratory Work	Teach the students the basic experiments related to thermodynamics, fluid mechanics and heat transfer.	✓	✓	✓	✓	3 hrs/week for 4 weeks

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting*	Remarks
	1	2	3	4		
Continuous Assessment: 40%						
Test(s) and Assignments	✓	✓	✓		20%	
Reports on Laboratory Works	✓	✓		✓	20%	2-4 reports to be submitted
Examination: 60% (duration: 3 hours)						
Examination	✓	✓	✓		60%	
** The weightings should add up to 100%.*					100%	

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

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Test(s) and Assignments	Capacity to understand the key concepts, principles and theories related to thermodynamics, fluid mechanics and heat transfer, and to analyse and solve related engineering problems.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Reports on Laboratory Works	Capacity to conduct experiments, obtain and analyse the data, and have discussions and conclusions based on the concepts, principles and theories learned from the lectures, as evident from the reports.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	Capacity to understand the key concepts, principles and theories related to thermodynamics, fluid mechanics and heat transfer, and to analyse and solve related engineering problems [@].	High	Significant	Moderate	Basic	Not even reaching marginal levels

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 (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

- Basic concepts of thermofluid: mass, volume, pressure, temperature, viscosity;
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- Properties of pure substances;
- Energy transfer by heat, work, and mass;
- First and second laws of thermodynamics;
- Entropy;
- Power and refrigeration cycles;
- Mechanisms of heat transfer: steady conduction, convection, and radiation.
- Hydrostatics: hydrostatic pressure, U-tube manometer, Archimedes' principle, surface tension, capillary effect, hydrostatic force on immersed plate.
- Steady flow processes – Navier-Stokes equation, continuity equation, momentum equation, steady flow momentum, Bernoulli and energy equations.
- Mass transportation process.
- Fluid in motion – flow measurement, pipe flow, boundary layer, flow with friction, lift and drag coefficients;

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Cengel Y.A., Cimbala J.M, Turner R.H., Fundamentals of Thermal-Fluid Sciences, McGraw Hill, ISBN0-073-38020-2.
2.	Robert W. Fox, Philip J. Pritchard, Alan T. McDonald, Introduction to Fluid Mechanics.

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Yunus A. Cengel and Michael A. Boles, Thermodynamics An Engineering Approach, The McGraw Hill Companies.
2.	Cengel Y.A., Heat Transfer: A Practical Approach, Second Edition, The McGraw Hill Companies.
3.	Incropera F.P., DeWitt D.P., Bergman T.L., Lavine A.S., Fundamentals of Heat and Mass Transfer, J. Wiley, ISBN978-0-471-45728-2.
4.	Kaminski D., Jensen M.K., Introduction to Thermal and Fluids Engineering, J. Wiley, ISBN978-0-471-26873-4.
5.	Young D.F., Munson B.R., Okiishi T.H., Huebsch W.W., A Brief Introduction to Fluid Mechanics, J. Wiley, ISBN978-0-470-59679-1.
6.	White F.M., Fluid Mechanics, McGraw Hill, ISBN0-072-40217-2.
7.	Marquand C., Croft D., Thermofluids, J. Wiley ISBN0-471-94184-0.

Online Resources

Massoud M., Engineering Thermofluids: Thermodynamics, Fluid Mechanics, and Heat Transfer (e-Book), Springer, ISBN978-3-540-27280-9.