City University of Hong Kong
Course Syllabus

offered by Division of Building Science and Technology
with effect from Semester A 2018/19

Part I Course Overview

Course Title:	Fluid Science
Course Code:	BST12512
Course Duration:	1 semester
Credit Units:	3 credits
Level:	A1
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	BST11512 Fluid Mechanics
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to provide students with the fundamental principles of fluid science; and to solve the basic engineering problems related to fluid statics and fluid flow. Students are expected to gain both the concepts and methods to handle the problems for fluid statics, pipe flow and external flow. Through a range of interactive learning experiences, students will gradually build up the fundamental principles of fluid statics and fluid flow.

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.	Solve basic problems of fluid statics.	15%	✓	✓	
2.	Solve problems of the fundamental principles of fluid flow.	25%	✓	✓	
3.	Apply principles of fluid flow in pipe flow and external flow.	50%		✓	✓
4.	Predict relationship of parameters of fluid flow.	10%	✓		
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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	
Pre-Class Study	This is a combination of selected reference books and/or lecture notes reading before each seminar session.	✓	✓	✓	✓	1 hr/wk
Seminar (Average class size: Around 50 students)	This is an in-class activity in groups involving oral presentation by lecturers and discussion with students on a selected topic through illustrating exercises, real-life examples and question generation by the students and answering by peers or by the lecturer.	✓	✓	✓	✓	3 hr/wk
Assignment	This is a combination of case problems and/or calculation exercises for guided students learning.	✓	✓	✓	✓	1 hr/wk

Note: There are generally 2 seminars, since the number of students is over 100.

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%						
Assignments/Tests/Projects	✓	✓	✓	✓	40%	
Examination: 60% (duration: 2.5 hours)						
** The weightings should add up to 100%.*					100%	

Note:

1. There are at least three continuous assessments.
2. A student must obtain a minimum mark of 35 in both coursework and examination and an overall mark of 40 to pass the course.

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. Assignments/ Tests / Projects	1.1 ABILITY to DESCRIBE and EXPLAIN the principles of fluid statics and fluid flow 1.2 ABILITY to SOLVE the engineering problems of fluid statics and fluid flow	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Examination	2.1 ABILITY to DESCRIBE and EXPLAIN the principles of fluid statics and fluid flow 2.2 ABILITY to SOLVE the engineering problems of fluid statics and fluid flow	High	Significant	Moderate	Basic	Not even reaching marginal levels

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.)

- Fundamental concepts: Viscosity; Newtonian fluid; fluid pressure; Pascal's law; pressure measurement.
- Fluid statics: Hydrostatic thrust; centroid; centre of pressure; buoyancy.
- Fluid flow: Flow pattern; types of flow; flow continuity; Bernoulli's equation; flow measurement; momentum equation; applications of Newton's second and third laws of motion.
- Pipe flow: Behaviour of real fluid; laminar and turbulent flow; Reynolds number; major and minor losses; friction factor; total energy gradient.
- External flow: Open channel; hydraulic mean depth; steady uniform flow.
- Similarity and dimensional analysis: similarity; dimensionless numbers; dimensionless groups.

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.)

NA

2.2 Additional Readings

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

1. Fluid Flow, ASHRAE Handbook – Fundamentals (latest edition), ASHRAE Inc.
2. Young, D.F., Munson, B.R., Okiishi, T.H., A brief introduction to fluid mechanics. Hoboken, NJ: Wiley, 2004.
3. Street, R.L., Watters, G.Z., Vennard, J.K., Elementary fluid mechanics. New York: J. Wiley, 1996.
4. Iynkaran, K. and Herath, K., Basic applied fluid mechanics: hydrostatics, dynamics and pumping systems. Singapore: Prentice Hall, 1993.
5. Crowe, C.T., Elger, D.F., Roberson, J.A., Engineering fluid mechanics. Hoboken, NJ: Wiley, 2005.
6. Douglas, J.F., Gasiorek, J.M., Swaffield, J.A., Fluid mechanics. Upper Saddie River, NJ: Prentice Hall, 2001.
7. Fox, R.W., McDonald, A.T., Pritchard, P.J., Introduction to fluid mechanics. Hoboken, N.J.: Wiley, 2004.
8. Marquand, C., Croft, D., Thermofluids: an integrated approach to thermodynamics and fluid mechanics principles. Chichester: J. Wiley, 1994.
9. Fluid mechanics.
   http://en.wikipedia.org/wiki/Fluid_mechanics
10. eFluids.
    http://www.efluids.com/
11. Fluid Mechanics, Engineering, OneSmarkClick.Com
    http://www.onesmartclick.com/engineering/fluid-mechanics.html
12. Fluid Mechanics, efunda Engineering Fundamentals
    http://www.efunda.com/formulae/fluids/overview.cfm