Subject Description Form

Subject Code	ME6402
Subject Title	Advanced Fluid Mechanics
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide both fundamental and advanced concepts and methods in fluid mechanics. 2. To introduce the state-of-the-art experimental methods in fluid mechanics.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate and solve flow problems by applying knowledge of fluid mechanics. b. Analyze and interpret data obtained from experimental or computational fluid mechanics. c. Communicate effectively through completing written reports of laboratory experiments. d. Conduct a comprehensive survey on selected topics in fluid mechanics through completing a mini project.
Subject Synopsis/ Indicative Syllabus	***Fundamentals*** – governing equations for Newtonian fluids; some solutions of the Navier-Stokes equations; non-Newtonian fluids; dimensional analysis . ***Irrotational Flows*** – theorems for irrotational flow; potential flow; added mass. ***Boundary Layers*** – introduction to boundary layer; the boundary layer equations; Falkner–Skan similarity solutions; flow separation. ***Flow Stability*** – linear stability theory of fluid flows; Couette-Taylor instability; stability of plane flows. ***Turbulent Flows*** – types of turbulent flows; statistical approach; turbulent models. ***Experimental Fluid Dynamics*** – basic pressure and flow rate measurements; flow visualization; flow velocity measurements.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental and advanced knowledge of fluid mechanics and relevant experimental methods.

Tutorials are used to illustrate the applications of fluid mechanics knowledge.

Laboratory experiments are arranged to relate the concepts to practical applications. Students are exposed to hand-on experience, proper use of equipment and application of analytical skills on interpreting experimental results.

A mini project is designed to have students learn how to collect, analyze and summarize up-to-date research information on selected topics in fluid mechanics.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Assignment / Lab Report / Mini Project Report / Test	60%	√	√	√	√
2. Examination	40%	√	√		
Total	100 %				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment: 0.6 (Continuous Assessment) + 0.4 (Examination)
Continuous Assessment: Assignment + Laboratory Report + Mini Project Report + Test

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the assignments, laboratory reports, mini project reports and the test, which provide timely feedbacks to both lecturers and students on various topics in the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lectures	33 Hrs.
▪ Tutorials and Laboratory Experiments	6 Hrs.
Other student study effort:	
▪ Assignments	20 Hrs.
▪ Mini-project and laboratory reports	20 Hrs.
▪ Self-learning	33 Hrs.
Total student study effort	112 Hrs.

Reading List and References	1. W. P. Graebel, Advanced Fluid Mechanics, Elsevier, latest version 2. R. L. Panton, Incompressible Flow, Wiley, latest version 3. G. K. Batchelor, An Introduction to Fluid Dynamics, Cambridge University Press, latest version 4. F. M. White, Viscous Fluid Flow, McGraw-Hill, latest version 5. H. Schlichting, K. Gersten, Boundary-Layer Theory, Springer, latest version 6. S. B. Pope, Turbulent Flows, Cambridge University Press, latest version 7. R. Goldstein, Fluid Mechanics Measurements, CRC Press, latest version

(Implemented from 2019/20 academic year.)

March 2019