Subject Description Form

Subject Code	AAE3008
Subject Title	Fundamental Thermal-fluid Science
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AP10005 Physics I **and** AMA2111 Mathematics I
Objectives	1. To provide students with basic knowledge of thermodynamics and fluid mechanics. 2. To develop students' capability of analysing thermal-fluid problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Formulate and solve thermal-fluid problems by applying knowledge of thermodynamics and fluid mechanics; b. Analyse and interpret numerical and experimental thermal-fluid predictions and observations; and c. Acquire a basic understanding of the state-of-the-art of this field.
Subject Synopsis/ Indicative Syllabus	**Basic concepts of thermodynamics –** Systems; State; Processes; Equation of state; Laws of thermodynamics; Heat transfer; Work; Entropy; Heat engines. **Basic concepts of fluid mechanics –** Properties of fluids; Streamlines, streaklines, and pathlines; Angular velocity, vorticity, and strain; Compressibility; Viscosity. **Fluid Statics –** Fluid pressure; Pascal's law and pressure-height relation; Buoyancy. **Fluid dynamics –** Control volumes and fluid elements; Substantial derivative; Reynolds transport theorem; Navier–Stokes equations; Euler's equation; Bernoulli's equation; Couette flow; Poiseuille flow. **Heat Transfer –** Heat conduction; Convection; Boundary-layer flow; Thermal radiation; Radiative properties.

Teaching/Learning Methodology

Teaching is conducted through class lectures and tutorials. They are aimed at providing students with integrated knowledge required for thermal-fluid applications.

Technical/scientific examples and problems are raised and discussed in lecture and tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	✓
2. Tutorial	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Homework assignment	20%	✓	✓	✓
2. Test	20%	✓	✓	
3. Examination	60%	✓	✓	
Total	100%			

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

Overall Assessment:

$0.60 \times$ End of Subject Examination + $0.40 \times$ Continuous Assessment

The continuous assessment consists of homework assignment and test. They are aimed at evaluating the progress of students' study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analysing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study	33 Hrs.
	▪ Homework assignment	50 Hrs.
	Total student study effort	122 Hrs.
Reading List and References	1. Cengel Y. A., Cimbala J. M., and Turner R. H., Fundamentals of Thermal-Fluid Sciences. McGraw-Hill, 5th edition. 2. White F. M., Viscous Fluid Flow. McGraw-Hill, 3rd edition. 3. Cengel Y. A. and Ghajar A. J., Heat and Mass Transfer: Fundamentals and Applications. McGraw-Hill, 6th edition.	

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