Subject Description Form

Subject Code	ME44002
Subject Title	Engine Technology
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics
Objectives	To provide students with the fundamental knowledge of engine technology, and its combustion-related emissions.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand and evaluate physical parameters of engine design and operating characteristics. b. Apply the fundamental knowledge of solving air-standard and real air-fuel engine cycles. c. Apply the fundamental knowledge of thermochemistry and fuels. d. Understand the general principles of engine combustion, emissions controls and standards.
Subject Synopsis/ Indicative Syllabus	***Introduction*** **-** Historical perspective of engines. Engine classifications. Terminology and abbreviations. Engine components. Basic engine cycles. ***Engine Design and Operating Characteristics*** - Engine parameters. Indicated work per cycle. Mean effective pressure. Brake torque and power. Dynamometers. Air-fuel and fuel-air ratios. Specific fuel consumption. Fuel efficiencies. Volumetric efficiency. Specific emissions and emission index. Relationships between performance parameters. Engine design and performance data. Noise abatement. ***Engine Cycles*** **-** Air-standard cycles. Otto Cycle. Diesel cycle. Dual cycle. Comparison of Otto, Diesel and Dual cycles. Real air-fuel engine cycles. ***Thermochemistry and Fuels*** **-** Thermochemistry. Gasoline, diesel and alternative fuels. ***Engine Combustion and Emissions*** **-** Spark ignition engine combustion, ignition and burning rate analysis. Compression ignition engine combustion, fuel injection, ignition delay. Engine emissions controls and standards. ***Introduction to Fuel Cell Technology*** – Working principle, types of fuel cells, cell components, polarization curve, transport phenomena; heat and water management.

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to internal combustion engines (outcomes a to d).

Tutorials will be conducted to facilitate discussions of typical examples and coursework assignments (outcomes a to d).

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lecture	√	√	√	√
Assignment/Tutorial	√	√	√	√

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	30%	√	√	√	√
2. Test	20%	√		√	
3. Examination	50%	√	√	√	√
Total	100%				

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

Overall Assessment:

$0.50 \times$ Examination $+ 0.50 \times$ Continuous Assessment

1. The continuous assessment will comprise two components: assignments (30%) and tests (20%). The assignments are aimed at evaluating the progress of students' studies, assisting them in fulfilling the respective intended subject learning outcomes, and enhancing the integration of their knowledge learnt. The mid-term test(s) covers the first half of the subject material and provides useful feedback to both the lecturer and students on the learnt topics.

2. The examination (50%) will be used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the intended subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial	6 Hrs.
Other student study effort:	
▪ Self-study/Coursework	67 Hrs.
Total student study effort	106 Hrs.

Reading List and References	1. C.R. Ferguson and A.T. Kirkpatrick, Internal Combustion Engines, John Wiley & Sons Inc., latest edition 2. W.W. Pulkrabek, Engineering Fundamentals of the Internal Combustion Engine, Prentice Hall, latest edition. 3. J.C. Guibet, Fuels and Engines- Technology, Energy and Environment, Vol. 1 & 2, Technip, Paris, latest edition.

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