

Internal Combustion Engines

Module Information

2022.01, Approved

Summary Information

Module Code	4501ICBTAE
Formal Module Title	Internal Combustion Engines
Owning School	Engineering
Career	Undergraduate
Credits	15
Academic level	FHEQ Level 4
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
International College of Business and Technology

Learning Methods

Learning Method Type	Hours
Lecture	45
Practical	12
Tutorial	15

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
APR-PAR	PAR	April	12 Weeks

JAN-PAR	PAR	January	12 Weeks
SEP_NS-PAR	PAR	September (Non-standard start date)	12 Weeks

Aims and Outcomes

Aims	This unit recalls the thermodynamic laws related to the operation of an engine and it will provide learners an introduction of internal combustion engines, its functionality, different types of engine configurations and the features of engines. The unit will also provide hands on skills of engines through a series of workshop exercises. The unit introduces the concepts of engine power, torque, efficiency and the unit aims to provide knowledge on enhancing engine performance and efficiency through technical advancements such as intercoolers, turbo chargers etc. In addition, the unit integrates the other systems such as exhaust systems, cooling systems, fuel control systems and lubrication
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After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Explain the functionality of different types of internal combustion engines, their performance and design features and compare the performance.
MLO2	2	Demonstrate the operation of an engine indicating the use of each component and illustrate the importance of these components for the overall engine design.
MLO3	3	Evaluate the need of systems like cooling system, lubrication system, fuel system and electrical spark generation and explain their operation.
MLO4	4	Carryout workshop activities such as basic assembly of engines, replacement of parts and performance testing and evaluation.

Module Content

Outline Syllabus	Recall of laws of thermodynamics and mechanics heat transfer in relation to internal combustion (IC) engines Different types of reciprocating internal combustion engines (inline, V, radial etc), typical design features, components and performance characteristics. Design features and characteristics of internal systems of power and motion transmission (use of crank, cam, wheels, belts, connecting rods etc.) Power cycles of internal combustion engines using ideal gas cycles, air cycles, and fuel-air cycles, power and thermal efficiency of IC engines. Firing process of an engine and power boosting through turbo charging, intercooling etc. Thermal loading of engine components and design of cooling systems. Mechanisms of combustion in SI-engines and CI-engines and fuel quality requirements of SI- and CI-engines. Exhaust systems, emissions and explain the mechanisms of emission formation and emission control with standards. Crank mechanism and inertia forces and moments in single- and multi-cylinder engines, balancing of inertia forces, use of flywheels etc. Dynamic forces in the crank mechanism and compute the angular speed variation of the crank shaft. Engine friction, wear and lubrication
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping

Portfolio	Practice	30	0	MLO2, MLO4
Exam	Exam	70	2	MLO1, MLO3

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Karl Jones	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings
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