

Module Details	
Module Title:	Automotive Powertrain Engineering
Module Code:	MAE6014-B
Academic Year:	2019-20
Credit Rating:	20
School:	Department of Mechanical and Energy Systems Engineering
Subject Area:	Mechanical and Automotive Engineering
FHEQ Level:	FHEQ Level 6
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	Hours
Lectures	36
Tutorials	12
Laboratory	8
Directed Study	144

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 1 (Sep - Jan)

Module Aims
To apply the principles which underlie the operation of engine and powertrain systems in order to design strategies to optimise performance, emissions and economy.

Outline Syllabus
ReReview of basic petrol and diesel engines; performance indicators. The delivery of air and fuel in spark-ignition(SI) and compression-ignition(CI) engines. Combustion in SI and CI engines. Factors which govern power, speed, torque and size. Induction and exhaust processes, principles of valve timing. Combustion processes in engines; ignition, flame propagation. Theory of combustion and combustion products. Knock in petrol engines, detection and avoidance.

Emissions; legislative requirements, after treatment systems. Principles of ignition timing; fuel delivery and control of air/ fuel ratio. Engine management systems: calibration, strategies to optimise performance, emissions and economy. Engine - driveline - vehicle matching: gear ratios, vehicle performance. Combustion in Compression Ignition engines. Turbocharging: specification of compressor and turbine sizes, performance matching. Engine - driveline - vehicle matching: gear ratios, vehicle performance. Effect of engine speed, turbulence and residual gases. Sources of gaseous emissions and particulates. Control of engine-out emissions and after-treatments. Catalytic converters and their operation. Legislative limits and requirements. Engine Management Systems (EMS). Design specification, operating conditions, location and protection.

Learning Outcomes

1	Critically review the complex interactions which underlie the performance, emissions and economy of automotive engines to allow critical evaluation of new and developing technologies. Show knowledge and understanding to allow a critical evaluation of the design and operation of the engine and powertrain. Identify the critical areas of operation. Apply modelling and simulation methods to allow calibration data for the EMS to be obtained.
2	Integrate material from many sources. Critically apply statistical skills to engine and powertrain prediction. Demonstrate engine testing skills.
3	Use the scientific method; Solve problems systematically; Manage, present and interpret data using IT skills. Show improved communication, teamwork, leadership and personal management skills.

Learning, Teaching and Assessment Strategy

Concepts are introduced using formal lectures and explored further during seminars. Oral feedback is given during the seminars. Assessment is by formal examination and a technical report.

Mode of Assessment

Type	Method	Description	Length	Weighting
Referral	Examination - closed book	Supplementary assessment: examination - closed book	2 hours	50%
Summative	Examination - closed book	Closed book exam 2 hours	2 hours	50%
Summative	Coursework	Coursework: 2 reports (1000 words each) 1- Powertrain Modelling 2- Engine Mapping and Calibration	0 hours	50%

Referral	Coursework	Supplementary coursework: Submit an Individual Powertrain Simulation Report (2000 words)	0 hours	50%
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Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>.

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.