

Module Details	
Module Title:	Vehicle Powertrain and Dynamics
Module Code:	MAE7030-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 7 (Masters)
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	Hours
Lectures	24
Laboratory	12
Directed Study	164

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 2 (Feb - May)

Module Aims
To systematically apply the principles which underlie the operation of engine and powertrain systems in order to design strategies to optimise performance, emissions and economy. Provide detailed study of vehicle dynamics using specialist CAE tools to understand the effect of key ride and handling performance parameters on vehicle stability.

Outline Syllabus
Overview of powertrain systems and components Vehicle performance prediction. Alternative fuels. Electric drive vehicles and hybrid systems.

Regenerative braking
 Review of chassis design principles.
 Vehicle Ride: kinematic, dynamic of suspension systems; suspension modelling and simulation.
 Tyre properties and tyre dynamics modelling and simulation.
 Vehicle Handling: Lateral vehicle dynamics, steady state and transient manoeuvres, analytical and numerical models for high speed cornering, steering systems, and steering characteristics.

Learning Outcomes

1	Critically review the complex interactions which underlie the performance, emissions and economy of automotive powertrains to allow critical evaluation of new and developing technologies.
2	Apply modelling and simulation methods vehicle and system dynamics in the systematic and critical analysis of complex problems.
3	Use CAE tools to assess vehicle ride and handling.
4	Use scientific methods; 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

The basic subject matter is introduced by lectures and computer laboratory sessions, using hardware examples and lectures from practitioners. Topics cover the science, technologies and principles that apply to vehicle ride, handling and propulsion. Directed study takes the form of background reading to deepen the understanding of the material

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Technical knowledge is consolidated by project work with the completion of a programme of coursework (Learning outcomes LO1-4). Final assessment is a closed book examination (Learning outcomes LO1, LO2). Supplementary assessment is to repair deficiency in original submission.

Formative assessment is enabled via an online assessment with immediate solutions enabling self-evaluation and identification of areas for support.

This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Third Edition (AHEP3) as published by The Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC). These outcomes specify six key areas of learning: Science and Mathematics (SM), Engineering Analysis (EA), Design (D), Economic, Legal, Social, Ethical and Environmental Context (EL), Engineering Practice (P) and Additional General Skills (G).

SM1m, SM2m, SM3m, SM4m, SM5m, EA1m, EA3m, EA4m, EA5m, D4, EL2, EL4, P1, P2m, P7, P9m, P11m, G1, SM7M, SM8M, SM9M, EA7M, D9M, D10M, EL8M, EL9M, EI11M, EL13M, P12M. Further details of these learning outcomes can be found at <https://www.engc.org.uk/>.

Mode of Assessment

Type	Method	Description	Length	Weighting
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Formative	Examination - MCQ	Test the formal knowledge and understanding with immediate solutions for self evaluation		%
Summative	Examination - closed book	2 hour closed book examination	2 hours	50%
Summative	Coursework	Portfolio of coursework on vehicle dynamics and powertrain	-2000 words	50%

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.