UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Vehicle Powertrain and Dynamics
Module Code	MAE7030-B
Academic Year	2024/5
Credits	20
School	School of Engineering
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Lectures	36
Tutorials	4
Directed Study	160

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 2

Module Aims

Systematically apply the principles which underpin 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 performance and handling.

Outline Syllabus
Overview of hybrid and electric powertrain systems and components. Vehicle performance prediction. Alternative fuels. Electric drive vehicles and hybrid systems. Regenerative braking. Review of chassis design principles. Vehicle Mechanics. Tyre Mechanics. Steering and suspension loads and kinematics. Steady State handling. Vehicle roll and lateral load transfer. Pitch and drive during acceleration and braking. Vehicle ride. Vehicle control systems. Computer classes on handling & dynamics. Computer lab classes on vehicle powertrain modelling.

Learning Outcomes	
Outcome Number	Description
01	Critically review the complex interactions which underpin the performance, emissions and economy of automotive powertrains to allow critical evaluation of new and developing technologies.
02	Apply systematic modelling and analysis methods relating to vehicle and system dynamics in the critical analysis of complex problems.
03	Use CAE tools to assess vehicle ride and handling.
04	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 combined lectures and computer laboratory sessions, using hardware and simulation examples to convey the concepts. Topics cover the science, technologies and principles that apply to vehicle ride, handling and propulsion of contemporary motor vehicles, hybrid and electric vehicle technology and vehicle control systems. Students will learn about vehicle dynamics in the context of ride and handling behaviour and will use calculations to predict vehicle performance. Computer simulations will be introduced, and students will use these to investigate vehicle handling and hybrid and electric vehicle performance prediction.

Directed study takes the form of background reading to deepen the understanding of the material. Technical knowledge is consolidated by project work with the completion of two pieces of coursework relating to vehicle dynamics (Learning outcomes LO2-4) and vehicle powertrain (LO1 & 4) in which students will demonstrate both depth and breadth of knowledge in the subject matter. Supplementary assessment is to repair deficiency in the original submission.

Students are given the opportunity to receive formative feedback on their coursework and learning during tutorial sessions.

This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Fourth Edition (AHEP4) as published by the Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC). These outcomes specify five key areas of learning which partially (C) or fully (M) meet the academic requirement for CEng registration: Science and Mathematics (1), Engineering Analysis (2-4), Design and Innovation (5-6), The Engineer and Society (7-11), and Engineering Practice (12-18). Further details of these learning outcomes can be found at https://www.engc.org.uk/ahep/

M1, M2, M3, M4, M5, M6, M7, M13, M16, M17,

Mode of Assessment

Type	Method	Description	Weighting
Summative	Coursework - Written	Coursework related to vehicle dynamics	50%
Summative	Coursework - Written	Coursework related to vehicle powertrain	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.
