

Module Details	
Module Title:	Vehicle Dynamics and Control
Module Code:	MAE6015-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	48
Tutorials	2
Laboratory	18
Directed Study	132

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims
Provide detailed study of vehicle dynamics using specialist CAE tools to understand the effect of key ride and handling performance parameters on vehicle stability. Study and analyse vehicle stability management and driver assisted control systems. Learn how to use CAE tools to design, simulate and analyse vehicle ride, handling and control.

Outline Syllabus
[1] Review of chassis design principles. [2] Vehicle Ride: kinematic, dynamic of suspension systems; suspension modelling and simulation. [3] Tyre properties and tyre dynamics modelling and simulation. [4] Vehicle Handling: Lateral vehicle dynamics, steady state and transient

manoeuvres, analytical and numerical models for high speed cornering, steering systems, and steering characteristics. [5] Longitudinal transient motion analysis: acceleration and braking, braking stability; wheel slip ratio, traction, linear and non-linear vehicle simulation models, [6] Control analysis and algorithms: Block diagram representation, computer aided control system design, general properties of feedback, standard time-domain inputs, response components, first and second order systems response. [7] Lateral vehicle control and state feedback, direct yaw control and four wheel steer control. [6] Chassis control systems technology: ESP, ABS, TCS, AWD, EPS, AWS, ARC, active and semi-active suspensions, Rollover and Rollover prevention.

Learning Outcomes

1	give an account of the various vehicle dynamics characteristics and analyse vehicle dynamics behaviour using fundamental dynamics principles; critically evaluate the performance of various vehicle management and control systems.
2	relate analytical and mathematical representation to the design, modelling and analysis of vehicle dynamics behaviour; use CAE tools to assess vehicle ride, handling and control systems.
3	work as a member of a team; analyse various transportation systems dynamics; use dynamics software to design and analyse a variety of dynamic systems.

Learning, Teaching and Assessment Strategy

The scientific basis of the subject is established in lectures supported by case studies, examples, analyses and demonstrations of the dynamics and control systems used in vehicles. The practical classes will provide opportunity to learn and test the methods using CAE tools. Technical knowledge is consolidated by hands-on project work to simulate and analyse dynamics and control systems and this form the assessment for this module. Supplementary assessment is to repair deficiency in the original assessment.

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Coursework	Group project: Vehicle Dynamics and Control Project using CAE tools. - Semester 2		60%
Summative	Classroom test	Class test - Semester 2	2 hours	40%

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.