MODULE SPECIFICATION

Part 1: Information			
Module Title	Vehicle Dynamics		
Module Code	UFMFVS-15-3	Level	Level 6
For implementation from	2022-23		
UWE Credit Rating	15	ECTS Credit Rating	7.5
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engineering Design & Mathematics		
Module Type:	Standard		
Pre-requisites	Dynamics 2021-22		
Excluded Combinations	None		
Co-requisites	None		
Module Entry Requirements	None		
PSRB Requirements	None		

Part 2: Description

Overview: A fundamental aspect of Automotive Engineering, this module starts by reviewing Single Degree of Freedom and Multiple Degree of Freedom (MDOF) vibrations, enhanced by looking at forced MDOF systems, using the quarter car model as a basis. The focus then shifts to the specifics of automotive chassis design and dynamics, discussing SAE coordinate systems, forces and loads on a vehicle, tyres, cornering (steady-state, low and high speed), springs and dampers and suspension types and parameters.

Educational Aims: On successful completion of this module, students will be in a position to apply advanced methods of engineering analysis to a range of complex problems that occur in an automotive engineering context.

Outline Syllabus: Review of SDOF and MDOF vibration (underpinned by mathematical topics of differential equations, eigenvalue and eigenvectors, matrix algebra and manipulation),

Forced MDOF (modal analysis, underpinned by mathematics of matrices),

Vehicle coordinate systems, forces and loads on a vehicle,

Tyres,

Steady-state cornering - low and high speed,

Springs and Dampers,

Suspension types and parameters.

Teaching and Learning Methods: This module will continue the delivery approach of dynamics modules covered at levels 4 and 5 and adopts a flipped delivery supported by recorded and on-line materials to encourage active learning.

Whole cohort teaching sessions are structured and focused on delivering active learning, based on students having conducted a wide range of pre-study activities. This is followed by structured, problem-focussed, tutorial sessions in TEAL spaces (smaller groups), making effective use of technology and engendering peer-learning and tutor facilitation in ad-hoc groups.

Facilitated sessions make extensive of simulation software to visualise and elucidate solutions, and provide methods and approaches to solve complex problems where hand calculations are tedious and/or problematic.

Study time outside of contact hours will be spent on working through pre-study (i.e. new) material (via notes and videos), exercises and example problems. The learning on the module is strongly supported by the use of technology and students are encouraged to engage in this material both prior to and after class contact sessions.

Part 3: Assessment

The principal method of assessment is through an examination delivered as Component A with a small element of assessment introduced in Component B to support the flipped class delivery strategy.

Component A
The interactive style of delivery leads to students receiving frequent formative feedback on their progress and hence students should be prepared to do the end of module assessment which takes the form of a 3 hour partially scenario-based end of semester examination.. Questions in exam focus on a mix of technical competency, analysis of real-world applications of content, and questions focussed on understanding, interpretation and practical applications of analysis of vehicle dynamics.

Component B
E-quizzes taken in each week are an additional means of ensuring engagement in delivery process and although summative, feeding into the module mark, also provide a formative feedback to students as a measure of understanding.

The resit assessment has the same profile as the first sit

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Examination - Component A	✓	80 %	End of module examination, assessing technical procedure, scenario-based investigation and fundamental vehicle dynamics knowledge (3 hours).
Online Assignment - Component B		20 %	e-quizzes
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Examination - Component A	✓	80 %	Exam (3 hours)

Online Assignment - Component B		20 %	e-assessment

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will achieve the following learning outcomes:

Module Learning Outcomes	Reference
Apply and implement knowledge of scientific and mathematical principles and methods necessary in the dynamics of vibrations, enabling appreciation of engineering context and the real-world application to vehicle dynamics. (SM1b, SM2b, EA1b, P8)	MO1
Select and apply mathematical methods, tools and notations proficiently in the analysis and solution of vibrational problems in the context of automotive chassis dynamics. (EA2, G1)	MO2
Apply and integrate knowledge of other engineering disciplines to support the study of vehicle dynamics involving complex systems. (SM3b)	MO3
Critically evaluate the performance of automotive chassis systems and components through the use of analytical, quantitative and qualitative methods and modelling techniques. (EA3b, P8, G1)	MO4

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	114
Total Independent Study Hours:	114
Scheduled Learning and Teaching Hours:	
Face-to-face learning	36
Total Scheduled Learning and Teaching Hours:	36
Hours to be allocated	150
Allocated Hours	150

Reading List

The reading list for this module can be accessed via the following link:

http://www1.uwe.ac.uk/its/itresources/software/softwareoncampus.aspx

Part 5: Contributes Towards

This module contributes towards the following programmes of study:

Mechanical Engineering MEng 2020-21