



## **Module Specification**

### **Vehicle Dynamics**

Version: 2026-27, v4.0, Approved

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## Part 1: Information

**Module title:** Vehicle Dynamics

**Module code:** UFMFVS-15-3

**Level:** Level 6

**For implementation from:** 2026-27

**UWE credit rating:** 15

**ECTS credit rating:** 7.5

**College:** College of Arts, Technology and Environment

**School:** CATE School of Engineering

**Partner institutions:** None

**Field:** Engineering, Design and Mathematics

**Module type:** Module

**Pre-requisites:** Dynamics 2025-26

**Excluded combinations:** None

**Co-requisites:** None

**Continuing professional development:** No

**Professional, statutory or regulatory body 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.

**Features:** Not applicable

**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),

Vehicle coordinate systems, forces and loads on a vehicle,

Tyres,

Steady-state cornering - low and high speed,

Springs and Dampers,

Suspension types and parameters.

Double Wishbone suspension kinematics

### **Part 3: Teaching and learning methods**

**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 or practical laboratory-based activities (smaller groups), making effective use of technology, facilities and engendering peer-learning and tutor facilitation in ad-hoc groups.

Facilitated sessions make extensive use 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.

**Module Learning outcomes:** On successful completion of this module students will achieve the following learning outcomes.

**MO1** Apply and implement knowledge of scientific and mathematical principles, including analytical, modelling, simulation, quantitative and qualitative methods, in the critical evaluation and analysis of the performance of automotive chassis systems and components, involving the solution of vibrational problems in this context.

**MO2** Apply and integrate knowledge of other engineering disciplines to support the study of vehicle dynamics involving complex systems.

**Hours to be allocated:** 150

**Contact hours:**

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

**Reading list:** The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://readinglists.uwe.ac.uk) via the following link

<https://rl.talis.com/3/uwe/lists/0BDB616D-F9B4-A043-D086-FD84D9A9A1D3.html?lang=en-GB&login=1>

## Part 4: Assessment

**Assessment strategy:** The principal method of assessment is through an examination with a small element of assessment to support the flipped class delivery strategy.

**Examination:**

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 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.

**Formative:** There are series of formative online e-assignments using the DEWIS and MATLAB Grader platforms. These are "assessment for learning opportunities" to enhance learning for specific topics and modelling techniques, and an opportunity to solve problems and complete exercises similar to questions and tasks comprising the summative exam.

The resit assessment has the same profile as the first sit.

**Assessment tasks:**

**Examination (First Sit)**

Description: End of module examination, assessing technical procedure, scenario-based investigation and fundamental vehicle dynamics knowledge (3 hours).

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2

**Examination (Resit)**

Description: Exam (3 hours)

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2

## **Part 5: Contributes towards**

This module contributes towards the following programmes of study:

Automotive Engineering {Foundation} [Frenchay] BEng (Hons) 2023-24

Automotive Engineering [Frenchay] BEng (Hons) 2023-24

Automotive Engineering [Frenchay] MEng 2023-24

Automotive Engineering [Frenchay] BEng (Hons) 2024-25

Automotive Engineering [Frenchay] MEng 2024-25

Automotive Engineering [Frenchay] MEng 2023-24

Automotive Engineering [Frenchay] - WITHDRAWN MEng 2024-25

Automotive Engineering [Frenchay] BEng (Hons) 2023-24

Automotive Engineering [Frenchay] BEng (Hons) 2024-25

Automotive Engineering {Foundation} [Frenchay] BEng (Hons) 2023-24

Automotive Engineering {Foundation} [Frenchay] BEng (Hons) 2022-23

Mechanical Engineering [Frenchay] BEng (Hons) 2023-24

Mechanical Engineering [Frenchay] BEng (Hons) 2023-24

Mechanical Engineering [Frenchay] MEng 2023-24

Mechanical Engineering [Frenchay] MEng 2023-24

Mechanical Engineering {Foundation} [Frenchay] BEng (Hons) 2023-24

Mechanical Engineering [Frenchay] BEng (Hons) 2024-25

Mechanical Engineering [Frenchay] MEng 2024-25

Mechanical Engineering {Apprenticeship-UCS} {Top-Up} [Frenchay] BEng (Hons)  
2025-26

Mechanical Engineering {Apprenticeship-UCW} {Top-Up} [Frenchay] BEng (Hons)  
2025-26

Mechanical Engineering {Apprenticeship-GlosColl} {Top-Up} [Frenchay] BEng  
(Hons) 2025-26

Mechanical Engineering [Frenchay] MEng 2023-24

Mechanical Engineering [Frenchay] MEng 2023-24

Mechanical Engineering [Frenchay] MEng 2024-25

Mechanical Engineering {Foundation} [Frenchay] BEng (Hons) 2022-23