Module specification

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Module Code	ENG6B1
Module Title	Automotive Dynamics
Level	6
Credit value	20
Faculty	FAST
HECoS Code	100201
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng Automotive Engineering	Core
MEng Automotive Engineering	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	30 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	0 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**30** hrs
Placement / work based learning	0 hrs
Guided independent study	170 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	22nd Aug 2022
With effect from date	Sept 2022
Date and details of revision	
Version number	1

Module aims

- To extend the analytical skills on engineering dynamics.
- To develop an understanding of vehicle dynamics including limit behaviour, tyre grip and suspension geometry.

Module Learning Outcomes - at the end of this module, students will be able to:

1	Develop key parameters and indicators for car and driver interaction with respect to car controllability
2	Define and resolve problems arising from the relationships between aspects of car design and vehicle performance.
3	Apply simulation and optimisation methods for improving chassis design and performance.

In addition, to the module learning outcomes, student will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: C1, C2, C3, C4, C17, M1, M2, M3, M4, and M17

Assessment

Indicative Assessment Tasks:
This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

All learning outcomes could be assessed by means of a unique report where the learners will be asked to design or redesign an entire suspension and steering system, this would allow them to assess the dynamic requirements of a full front axle of a given vehicle. The indicated word count of the report should be 4000 words or equivalent.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1,2,3	Written Assignment	100%

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Learning and Teaching Strategies

The module is taught through a combination of lectures and workshops. An active and inclusive approach is used to engage learners in the topics and will involve individual, group work and flipped learning experiences aligned to the university's Active Learning Framework (ALF). The approach offers students a flexible and adaptive learning experience that can accommodate a range of options that includes both on campus learning and remote learning where appropriate.

The Moodle VLE and other on-line materials and resources will be available to support learning. ALF offers a balance between the classroom elements and digitally enabled activity

incorporating flexible and accessible resources and flexible and accessible feedback to support learning.

Indicative Syllabus Outline

Tyre grip: Tyre shear force development, measurement, and characterisation.

Suspension: Suspension geometry description and analysis of important properties; vibration behaviour of car and wheels; springs and dampers; track roughness.

Chassis dynamics: Suspension / chassis interactions; steady turning equilibrium states and responses; roll angles, load transfers, jacking; yaw / sideslip handling dynamics; understeer and oversteer; stability and controllability.

Limit behaviour: Limit behaviour and design aspects; differentials; brake balancing.

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads

D. Haiping, Modeling, *Dynamics, and Control of Electrified Vehicles.* Elsevier Science & Technology, 2017.

J. Pauwelussen, *Essentials of Vehicle Dynamics.* Elsevier Science & Technology, 2014.

Other indicative reading

H. Pacejka, *Tyre and Vehicle Dynamics.* Elsevier Science & Technology, 2006.

T. Gillespie, *Fundamentals of Vehicle Dynamics.* Society of Automotive Engineers, Inc., Warrendale, PA, 1992.

Employability skills – the Glyndŵr Graduate

Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes
Engaged
Creative
Ethical

Key Attitudes
Commitment
Curiosity
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Critical Thinking
Communication