

Module specification

When printed this becomes an uncontrolled document. Please access the Module Directory for the most up to date version by clicking on the following link: [Module directory](#)

Module Code	ENG5D4
Module Title	Motorsport Performance and Aerodynamics
Level	5
Credit value	20
Faculty	FACE
HECoS Code	100206
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Motorsport Engineering	Core

Breakdown of module hours

Learning and teaching hours	24 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	24 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	48 hrs
Placement hours	0 hrs
Guided independent study hours	152 hrs
Module duration (Total hours)	200 hrs

Module aims

This module develops applied understanding through a balance of theory and practice. Learners undertake both classroom study and supervised practical activity to explore design, implementation, and evaluation processes. Collaborative work and enquiry-based learning foster communication, teamwork, and the confidence to apply problem-solving techniques in varied contexts.

This module aims to develop students' analytical understanding of motorsport vehicle performance and aerodynamics, linking mechanical grip and aerodynamic effects to

measurable performance outcomes and preparing students for advanced Level 6 analytical work. The analysis is based on applied, engineering-first modelling suitable for Level 5, with emphasis on assumptions, limitations, and interpretation of results.

Module Learning Outcomes

At the end of this module, students will be able to:

1	Analyse key motorsport performance parameters, including acceleration, braking, and cornering, using appropriate engineering principles and quantitative methods
2	Explain and evaluate aerodynamic forces acting on a vehicle, and assess their influence on stability, grip, and overall performance across different operating conditions
3	Select, evaluate, and apply technical literature, experimental observations, and analytical data to assess vehicle performance and aerodynamic behaviour, and justify conclusions in a structured performance analysis report

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.

Assessment 1: Portfolio

Assessment is by a single portfolio containing various elements. Students must produce a technical performance analysis report based on a selected motorsport vehicle, vehicle concept, or provided case-study dataset.

The portfolio must quantify and interpret key vehicle performance parameters and evaluate how aerodynamic loading affects measurable performance outcomes.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1-3	Portfolio	3000	100	N/A

Derogations

Credits shall be awarded by an Assessment Board for those modules in which a pass mark 40% has been achieved, with a minimum mark of 30% in each assessment element.

Learning and Teaching Strategies

Learning integrates conceptual study with practical investigation to deepen understanding and enhance problem-solving ability. Students participate in lectures, laboratory work, and team-based projects that encourage collaboration and communication. Online materials, recordings, and discussion forums support blended engagement. Tutorials promote reflective learning and increasing autonomy in preparation for advanced study.

Welsh Elements

This module will be delivered through the medium of English; however, students have the option to submit their assessments in the medium of Welsh. While this module is not currently offered fully through Welsh, Welsh language support and guidance are available, and some learning materials or tutorial discussions may incorporate Welsh elements where appropriate. To further promote bilingual learning, all students have the opportunity to take the 20-credit *Welsh for STEM* short course, designed to develop confidence and subject-specific language skills in both English and Welsh.

Indicative Syllabus Outline

- Performance fundamentals (Acceleration, braking, and cornering performance, and the physical limits governing motorsport vehicle behaviour)
- Traction and weight transfer (Longitudinal and lateral load transfer mechanisms and their influence on performance during dynamic manoeuvres)
- Aerodynamic forces (Drag, lift, and downforce generation, and their effects on speed, stability, and vehicle performance)
- Aerodynamic devices and flow control (Wings, diffusers, splitters, and basic vortex control concepts used in motorsport applications)
- Aero balance and performance interaction (Pitch sensitivity, aerodynamic balance, and the interaction between aerodynamic loading and vehicle performance)
- Performance assessment and applied analysis (Performance envelopes, lap time implications, introductory interpretation of CFD results, and practical aero observation using low-speed testing and flow visualisation)

Mathematical level and approach: The module uses Level 5 applied mathematics (algebra, trigonometry, basic differentiation, unit-consistent modelling) to quantify performance and aerodynamic effects.

Indicative Bibliography

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

Essential Reads:

J. Katz, *Race Car Aerodynamics: Designing for Speed*, 2nd ed., Cambridge, MA, USA: Bentley Publishers, 2016.

Other indicative reading:

A. McBeath, *Competition Car Aerodynamics*, Ramsbury, UK: Crowood Press, 2018.

T. Wright, *Formula 1 Technology*, 1st ed., Warrendale, PA, USA: SAE International, 2001.

H. Hucho, *Aerodynamics of Road Vehicles: From Fluid Mechanics to Vehicle Engineering*, 5th ed., Warrendale, PA, USA: SAE International, 2013

Administrative Information

For office use only	
Initial approval date	June 2026
With effect from date	September 2026
Date and details of revision	
Version number	1