Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG6D6
Module Title	Power Analysis and Integration
Level	6
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	21 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	21 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**42 hrs**
Placement hours	0 hrs
Guided independent study hours	158 hrs
Module duration (Total hours)	**200 hrs**

Module aims

This module integrates advanced theoretical study with applied laboratory investigation. Students critically evaluate techniques, interpret data, and justify design or methodological decisions within a professional context. The combination of theory and practice cultivates independent learning, innovation, and readiness for individual project or dissertation work.

This module aims to develop students' advanced ability to analyse, integrate, and justify motorsport powertrain systems by linking performance, efficiency, diagnostics, and packaging constraints within a professional engineering context.

Module Learning Outcomes

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

1	Critically analyse powertrain performance using torque, power, efficiency, and fuel consumption metrics to evaluate suitability for motorsport applications (AHEP-4 C1, C7).
2	Evaluate and justify the integration of internal combustion, hybrid, or electric powertrain subsystems within a motorsport vehicle platform, considering packaging, thermal, and operational constraints (AHEP-4 C1, C7).
3	Apply and interpret diagnostic and measurement techniques to inform engineering decisions and support evidence-based integration and design choices.

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 conducted through a structured portfolio of evidence designed to evaluate knowledge and understanding of motorsport powertrain theory. The portfolio serves as a comprehensive record of student achievement and may incorporate a flexible mix of assessment methods, including time-constrained quizzes to test theoretical recall, written assignments to detail the packaging and integration strategy, and presentations to verbally defend engineering choices. Within this cumulative portfolio, students must critically evaluate integration trade-offs, justify their design decisions professionally, and provide supporting evidence of their understanding.

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 combines theoretical exploration with applied laboratory investigation to bridge conceptual understanding and professional competence. Students critically analyse data, test approaches, and evaluate outcomes in practical settings. Blended delivery through the Virtual Learning Environment supports flexibility and reflection. Tutorials focus on independent enquiry, innovation, and readiness for project or dissertation work.

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

Powertrain Performance Analysis: Evaluation of key performance metrics, including torque, power, brake mean effective pressure (BMEP), brake specific fuel consumption (BSFC), and efficiency maps to assess suitability for motorsport applications.

Forced Induction Systems: Analysis of turbocharging, intercooling, and boost control strategies, examining their impact on engine performance, efficiency, and responsiveness.

Hybrid and Electric Powertrain Integration: Evaluation of hybrid and electric powertrain architectures, including power delivery, regenerative systems, and control strategies within motorsport vehicles.

Packaging, Transmission, and Thermal Considerations: Assessment of powertrain packaging, gear ratio selection, and optimisation within chassis constraints, alongside thermal management and cooling system design for high performance applications.

Diagnostic Tools and Measurement Techniques: Application of diagnostic tools such as tachometers, onboard diagnostics (OBD), thermal imaging, and inspection systems to collect and interpret performance data.

Evidence Based Engineering Decision Making: Interpretation of diagnostic data to inform design decisions, validate system performance, and support the integration and optimisation of powertrain systems within motorsport applications.

Indicative Bibliography

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

Essential Reads:

W. Pulkrabek, *Engineering Fundamentals of the Internal Combustion Engine*, 2nd ed., Upper Saddle River, NJ, USA: Pearson, 2004.

Other indicative reading:

T. Wright, *Formula 1 Technology*, 2nd ed., Warrendale, PA, USA: SAE International, 2017.

J. B. Heywood, *Internal Combustion Engine Fundamentals*, 2nd ed., New York, NY, USA: McGraw-Hill, 2018.

Plus, various others to be signposted on Moodle.

Administrative Information

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