Module specification

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Module Code	ENG6B2
Module Title	Modern Automotive Powertrains
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 (Hons) 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 further develop powertrain theory, studied at level 5, applying it to high efficiency powertrain design; motors and engines, energy storage systems, chassis and transmission matching; and advanced braking/regenerating systems.

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

1	Further develop mechanical and thermo-fluid behaviour of high efficiency engines.
2	Analyse the operation of modern high-efficiency vehicle transmission and braking systems
3	Select and match powertrain sub-systems including energy storage– engine/motor and elements of transmission - to a given application.

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, C13, C17, M1, M2, M3, M4, M13 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 are assessed by means of a formal time constrained examination (3 hours).

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1,2.3	Examination	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

Alternative fuels: Special conditions and implications relating to alternative fuels.

Energy storage: Capacitors and supercapacitors, secondary batteries and H2 storage

Energy transformation systems:

Conventional engines: Performance characteristics, performance indices; idealised thermodynamic cycles and the limits to ideal behaviour; thermo-fluid implications of maximising power output using high engine speeds. supercharging and turbocharging; fuel systems, combustion control and emissions

Electric motors: Synchronous and asynchronous, AC and DC machines characteristics, DC/DC and DC/AC convertors for motors applications including energy regeneration (braking)

Vehicle transmission and gears: Gears, Vehicle transmission system design; hybrid powertrain design and analysis; traditional braking systems design and analysis.

Indicative Bibliography:

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

Essential Reads

H. Du, *Modeling, Dynamics, and Control of Electrified Vehicles*. Elsevier Science & Technology, 2017.

A. Hugues, *Electric Motors and Drives*. Elsevier Science & Technology, 2019.

Other indicative reading

Y. Chen, *Automotive Transmissions: Design, Theory and Applications*. Springer, 2021.

W. Pulkrabek, *Engineering Fundamentals of the Internal Combustion Engine*. Prentice-Hall, 2003.

A. Stokes, *Manual Gearbox Design*. Butterworth Heineman, 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
Enterprising
Creative
Ethical

Key Attitudes
Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Leadership and Team working
Critical Thinking
Emotional Intelligence
Communication