Module Specification

Motorsport Performance

Version: 2022-23, v5.0, 24 Aug 2022

Contents

Part 1: Information

Module title: Motorsport Performance

Module code: UFMFT9-30-3

Level: Level 6

For implementation from: 2022-23

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Delivery locations: Frenchay Campus, Global College of Engineering and Technology (GCET)

Field: Engineering, Design and Mathematics

Module type: Standard

Pre-requisites: Automotive Technology 2022-23

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module introduces advanced automotive/motorsport specific content in engines, aerodynamics, vehicle dynamics and vehicle systems. The knowledge presented here will be used to extend specialist knowledge at level 4.

Features: Not applicable

Educational aims: See Learning Outcomes

Outline syllabus: The syllabus includes:

Vehicle Dynamics (Chassis):

Vehicle control and design parameters that impact on handling performance.

Yaw and roll analysis.

Suspension concepts and design

Critical and characteristic speeds and static margin, yaw and roll.

Experimental techniques and vehicle handling performance prediction.

Chassis data acquisition and analysis.

Vehicle Dynamics (Aero):

Ground effect;

Wheel drag.

Vortices and vortex generation.

Effect of Aerodynamic force on Performance - Aerodynamic force and maximum speed; Drag effect on fuel consumption and acceleration.

Fundamental analysis of forces affecting car stability - Position of the centre of aerodynamic pressure; Side force; Aerodynamic moments about centre of gravity.

Effect of Aerodynamic forces on steady stability - Equations of equilibrium; The static

margin; Turning characteristics.

Wind tunnels and Measurement techniques.

Engines:

Review of engine performance descriptors and terminology.

Analysis of complex problems: analytical and numerical methods.

Analytic approaches: the Air Standard cycle; review of thermodynamics.

Numerical approaches: a framework for a simulation model; validation.

Synergy of theoretical modelling and experimental testing: Willan's Line.

Properties of the working fluid; standard methods of prediction; approximations and simplifications.

Fuel-Air mixtures; stoichiometry.

The Fuel-Air cycle; improved predictive capability.

The combustion process: underlying processes, empirical models, implementation in simulation.

Ignition Timing: simulations, observations and implications.

Gas Exchange Processes: analytic and numerical approaches; throttled running, pumping work, residual gas fractions.

Part 3: Teaching and learning methods

Teaching and learning methods: All group lecture supported by small group laboratory sessions that will provide experience of empirical methods.

Study time outside of contact hours will be spent on going through exercises and example problems as well as assignment preparation.

Scheduled learning includes lectures, tutorials\lab sessions.

Independent learning includes hours engaged with essential reading, assignment preparation and completion.

Contact Hours:

Activity:
Contact: 72 hours
Assimilation and skill development: 126 hours
Coursework: 34 hours
Exam preparation: 68 hours
Total: 300 hours

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

MO1 Steady state vehicle dynamics, vehicle aerodynamics and its impact on performance

MO2 Show detail knowledge and understanding of engine combustion and modelling

MO3 Develop knowledge and understanding of the techniques for solving and analysing complex problems relating to vehicle dynamics

MO4 Show cognitive skills in developing modelling and simplifying real problems, applying fundamental principles of mechanical engineering to the analysis of realistic problems and making recommendations based on analysis

MO5 Ability to model and simplify real problems, apply mathematical methods of analysis, and understand the capabilities of computer based modelling

MO6 Demonstrate key transferable skills in problem formulation and decision making, interpreting experimental results

MO7 Demonstrate the ability to progress to independent learning

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ufmft9-30-3.html

Part 4: Assessment

Assessment strategy: Component A: Examination
Assessed via end of year Exam to assess the students understanding of concepts and techniques.

Component B: Coursework
Assessed via 1 piece of coursework on an applied engineering problem to encourage engagement and focus on formative function and independent learning.

The GCET delivery of this exam is a 3 hour exam. It was agreed that GCET can deliver the exam in a different way to UWE for in-country reasons for 2021/22 and 2022/23 providing there is no change to the UWE assessment during this time.

Assessment components:

Examination (Online) - Component A (First Sit)

Description: Online Exam (5 hours)
Weighting: 75 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO4, MO5, MO6

Written Assignment - Component B (First Sit)
Description: Coursework assessment
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO3, MO4, MO5, MO6, MO7

Examination (Online) - Component A (Resit)
Description: Online Exam (5 hours)
Weighting: 75 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO4, MO5, MO6

Written Assignment - Component B (Resit)
Description: Coursework assessment
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO3, MO4, MO5, MO6, MO7

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechanical Engineering and Vehicle Technology {Foundation}
[Feb][FT][GCET][4yrs] BEng (Hons) 2019-20

Mechanical Engineering and Vehicle Technology {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2019-20

Automotive Engineering [Sep][FT][Frenchay][4yrs] - Not Running MEng 2020-21

Automotive Engineering [Sep][FT][Frenchay][3yrs] - Not Running BEng (Hons) 2020-21

Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2019-20

Automotive Engineering {Foundation} [Sep][FT][Frenchay][5yrs] MEng 2019-20

Automotive Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2019-20

Automotive Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2019-20

Automotive Engineering {Foundation} [Sep][SW][Frenchay][6yrs] MEng 2018-19

Automotive Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19