



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

MODULE DIRECTORY

LEVEL 6

ENGINEERING

WALES INSTITUTE OF SCIENCE & ART

2021-2022

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INTRODUCTION

This Module Directory includes all the modules for Level 6 within Engineering in the academic year 2021-2022.

This directory accompanies the Programme of Study Handbook, which will provide you with details of which modules you will be studying for your programme this year in the 'Programme of Study' section. This directory may include modules that are running on other programmes of study within your Academic Discipline/Institute. If you require assistance in identifying the modules for your programme of study, please contact the Programme Manager (whose name and contact details are provided in the accompanying Programme of Study Handbook), or the relevant Institute Office.

The University has made every effort to make the information as full and as accurate as possible, but you should note that minor changes in the organisation of modules between the planning stage and the actual teaching are inevitable. We shall try to keep any such changes to a minimum, and you will receive plenty of advance warning in the event of any alteration. We would also be grateful if you would let us know about any changes that you think might be helpful if introduced into future handbooks.

MODULES

Module Code	ACHA6003
Title	Ride, Handling & NVH
Date	17/09/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- The module aims to provide the student with the knowledge and understanding to evaluate vehicle ride, handling and NVH (Noise Vibration & Harshness)

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- demonstrate knowledge and understanding of vehicle suspension response under applied road inputs
- To evaluate the effects asymmetric traction forces and the effect on vehicle yaw response / control
- Critique sources of vehicle NVH, their transfer and effect upon human physiology and psychology.

INDICATIVE CONTENT

- Spring Mass Damper Systems
 - Suspension damping and damper construction
 - One, two and four degree of freedom suspension models and vehicle response
- Asymmetric drive forces
 - Vehicle mass distribution effects
 - Differentials
 - Vehicle yaw control
- NVH
 - NVH effect on humans and sound quality perception.
 - NVH generation. Wind, tyre, powertrain and driveline.
 - Transfer functions of vibrations and sound
 - Acoustics
 - Damping and suppression techniques

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written technical report	3000 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	50%
Practical	0%
TOTAL	100%

AHEP3 Version 3 outcomes to be met:

SM1b, SM2b, EA2, EA3b, EA4b, D1, D3b, P1, P3, P4, P8, G1

INDICATIVE READING LIST

Module Code	ACHA6003	
Module Title	Ride, Handling & NVH	
Classification	Reading List entry	Electronic*
Essential	Gillespie, T. D. <i>Fundamentals of Vehicle Dynamics</i> . Warrendale, Pa.: Society of Automotive Engineers, 1992. Print.	☐
Essential	Guiggiani, M., <i>The Science of Vehicle Dynamics</i> 2 nd Edition (Springer 2018)	☐
Essential	Pang, J., <i>Noise and Vibration Control in Automotive Bodies</i> (Wiley-Blackwell 2018)	☐
Essential	Brandt, A., <i>Noise and Vibration Analysis</i> (John Wiley and sons 2011)	☐
Further	Bastow D., Howard, G. and Whitehead. J., <i>Car Suspension and Handling</i> - 4 th Edition (Society of Automotive Engineering, 2004)	☐
Further	Dixon, J., <i>Tires, Suspension and Handling</i> - 2 nd Edition (Society of Automotive Engineering, 1996)	☐
Further	Schüetz, Thomas. <i>Aerodynamics of Road Vehicles</i> . Fifth ed. 2016. Print.	☐

Further	Blundell, M. and Harty, D., The Multibody Systems Approach to Vehicle Dynamics (Elsevier Butterworth-Heinemann, 2014)	☐
Further	Jacobson, Bengt. Vehicle Dynamics Compendium. 2017. Web. http://publications.lib.chalmers.se/records/fulltext/225751/local_225751.pdf	☒
Further	Day, A., Braking of Road Vehicles (Butterworth Heinemann 2014)	☐
Further	Thompson, J. K., Brake NVH: Testing and Measurements (SAE International 2011)	☒
Further	The Engineering Integrity Society http://e-i-s.org.uk/	☐
Further	Fuchs, A., Automotive NVH Technology (Springer 2015).	☐
Further	Singiresu S.Rao. Mechanical Vibrations in SI units (Person 6 th edition Nov2014) ISBN 978- 1292178608	☐
Further	Sinha J.K. Vibration Analysis, Instruments and Signal Processing. (CRC Press Nov 14) ISBN 978-1482231441	☐
Further	Tuma J. Vehicle Gearbox Noise and Vibration (Wiley Feb 2014) ISBN 978-1118359419	☐

Module Code	ACHA6006
Title	Contemporary Powertrain Design
Date	17/09/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To introduce the student to dynamics and resulting stresses within a modern high-performance engine and to understand the combustion mechanisms, fuel chemistry and modelling for spark ignition (SI) and compression ignition (CI) engines

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate cognitive skills in how to improve performance and weight characteristics of next-generation engines with emphasis on powertrain sustainability; with the analysis of combustion and emissions mechanisms for conventional and biofuels used in SI and CI automotive applications
- Critically analyse the development opportunities in ICE and its integration to Electric and Hybrid Powertrain to meet future fuel efficiency, CO₂ and emissions requirements for automotive, motorcycle and motorsport applications

INDICATIVE CONTENT

- Fuel chemistry, stoichiometry, rich and lean fuel balance equations for various fuels.
- Enthalpy of formation and calculations of heat release.
- Combustion properties and emissions mechanisms.
- Basic NO_x formation model using Zeldovich mechanisms.
- Alternative IC concepts – including SI, CI, GDI, CAI, HCCI.
- Alternative power cycles – Atkinson, Rankine and Miller
- Crankshaft, piston and connecting rod kinematics and stress analysis
- Engine component balancing
- Friction analysis and techniques to reduce friction at high rpm
- Material properties and design requirements for major moving and stressed components specifically for low friction, high efficiency applications
- Emissions Regulations, commercial, legal & environmental considerations
- Engine control strategies and emissions modelling.

- Simulation of alternative power provider's drive-cycle emissions
- Alternative powertrain strategies and optimisation

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	3000 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	3000 words	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	100%
Practical	0%
TOTAL	100%

AHEP3 Version 3 outcomes to be met:

SM1b, SM3b, EA1b, EA2, D1, D2, D4, EL2, EL4, P1, P2, P4, P5, P8, G1, G4

INDICATIVE READING LIST

Module Code	ACHA6006	
Module Title	Contemporary Powertrain Design	
Classification	Reading List entry	Electronic*
Essential	Heywood, J., Internal Combustion Engine Fundamentals 2ED, McGraw-Hill Education; 2 edition (31 May 2018)	☒
Essential	Simulating Combustion: Simulation of combustion and pollutant formation for engine-development, Springer Berlin Heidelberg; 2006 edition (10 Oct. 2008)	☐
Further	Modern electric, hybrid electric, and fuel cell vehicles: fundamentals, theory, and design. (CRC Press 2018)	☐
Further	Thermodynamics: Concepts and Applications, Cambridge University Press; Har/Cdr edition (6 Mar. 2006)	☐
Further	http://www.electricmotorsport.com/	☒
Further	http://www.avt.uk.com/	☒
Further	http://www.fiaformulae.com/	☒
Further	http://www.dft.gov.uk/vca/	☒

Module Code	ACHA6007
Title	Motorcycle Design & Innovation
Date	17/09/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To explore with the student, the more complex aspects of the dynamics of the motorcycle, the influence of the rider and other 'hard to quantify' factors and the technical limitations experienced at the performance limits of the vehicle

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate knowledge and critical understanding of the processes governing the dynamic behaviour of a motorcycle, its suspension, steering, tyres and rider interaction while in motion.
- Display comprehensive skills in the use of advanced data acquisition interpretation techniques to interpret dynamic data with which to validate complex motorcycle simulation models

INDICATIVE CONTENT

- Frame Design Requirements and Torsional Stiffness's
- Motorcycle Design, Aesthetics and Commercial Drivers
- Modelling of Tyres
- One, two and four degree of freedom suspension modelling
- Detailed analysis, processing and interpretation of real dynamics data
- Analysis of the Rider as a part of the Machine.
- Rider Psychology and Cognitive Aptitude in Motorsport
- The Requirements of the Modern MotoGP/Competition Motorcycle.
- Motorcycle Powertrain, Launch and Traction Control Strategies
- Active Safety Systems including collision avoidance
- Motorcycle Manoeuvrability and Directional Stability
- Roll motion, Steering Torque and Steer Angles
- Motorcycle Emissions Regulations and Implementation

- The modern motorcycle and its future sustainability

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Practical / Time Limited	Journal Paper – 3000 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Assessment of Practical Work Report	3000 words	50%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	50%
Practical	50%
TOTAL	100%

AHEP3 Version 3 outcomes to be met:

SM1b, SM2b, EA2, EA3b, D1, D3b, P1, P3, P4, P6, P8, G1

INDICATIVE READING LIST

Module Code	ACHA6007	
Module Title	Motorcycle Design & Innovation	
Classification	Reading List entry	Electronic*
Essential	Cossalter, V., Motorcycle Dynamics (Lulu, 2006)	☐
Essential	Spalding, N., MotoGP Technology (J H Haynes & Co Ltd, 2006)	☐
Further	Foale, T., Motorcycle Handling and Chassis Design (Tony Foale, 2002)	☐
Further	Bradley, J., The Racing Motorcycle: A Technical Guide for Constructors (Volumes 1 and 2) (Broadband Leisure Publications, 2003)	☐
Further	Journals as appropriate	☒

Module Code	ACHA6010
Title	Structural Design & Fluid Analysis
Date	17/09/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To provide the student with the necessary skills required to investigate structural design and fluid engineering problems.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically analyse and evaluate techniques for structural and fluid problems and CAE results
- Demonstrate competence in the application of suitable software packages to investigate engineering structural and fluid problems and cognitive skills in the formulation and analytical solution of a problem within the chosen engineering specialism

INDICATIVE CONTENT

- Structural Design
 - The role of FEA in the lifecycle
 - Analysis types
 - Overview of FEA and creating an FE model
 - Mesh quality checks
 - 1D v 2D v 3D elements
 - Thermal effects on structures
 - Common design issues
 - DFMEA
 - Application of commercial software
- Fluid Mechanics
 - Bernoulli's Equation
 - Reynolds Number
 - Boundary layer development
 - Separation
 - Turbulence
 - Euler Equation Derivation
 - Navier-Stokes Equations
 - CFD Process & Approach
 - Application of commercial software
- Application of commercial software to investigate structural and fluid problems
 - Solidworks : Builds on Modelling and FEA skills introduced in Level 5 and allows students to explore more complex simulation situations such as vibrational or thermal analysis applied to engineering problems

- Fluent/HelyxOpenFoam: Allows the simulation and validation of 2D and 3D Computational fluid dynamics problems. CFD theory and practice, parallelisation of solvers, Higher order meshing including meshing theory

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	3000 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	3000 words	50%

Assessment Summary

Activity type	Percentage
Written exam	0
Coursework	100%
Practical	0
TOTAL	100%

AHEP3 Version 3 outcomes to be met:

SM1b, EA1b, EA2, EA3b, D3b, D5, P2, P3, P4, P6, P7, P8

INDICATIVE READING LIST

Module Code	ACHA6010	
Module Title	Structural Design & Fluid Analysis	
Classification	Reading List entry	Electronic*
Essential	Versteeg, Malalasekera, and Malalasekera, W. An Introduction to Computational Fluid Dynamics: The Finite Volume Method. 2nd ed. Harlow: Pearson Prentice Hall, 2007. Print.	☐
Essential	Hearn, E.J. <i>Mechanics of Materials, vols.1 & 2</i> , Butterworth-Heinemann, 1997	☐
Essential	Ferziger, J. H. and Perić, M., Computational Methods for Fluid Dynamics (Springer, 2002)	☐
Essential	Mac Donald, Bryan J. Practical Stress Analysis with Finite Elements. 2nd ed. Dublin: Glasnevin, 2011. Print.	☐
Further	McBeath, S., Competition Car Aerodynamics (Haynes, 2011)	☐
Further	Katz, J., Race Car Aerodynamics: Designing for Speed (Robert Bentley, 1995)	☐
Further	Barnard, R. H., Road Vehicle Aerodynamic Design: An Introduction (Mechaero, 2001)	☐
Further	Sifakis, Eftychios. and Jernej. Barbic. Finite Element Method Simulation of 3D Deformable Solids. 2016. Synthesis Digital Library of Engineering and Computer Science. Web.	☐
Further	Vanderplaats, G. N., Multidiscipline Design Optimisations (VR&D, 2007)	☐
Further	Bernoulli Aerodynamics International, Racecar Graphic (2006)	☐

Module Code	ACHA6011
Title	Advanced Motorsport Dynamics
Date	17/09/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To build on previous vehicle dynamics module to include combined accelerations and damping in transient vehicle performance
- To analyse the effect of asymmetric traction forces and the effect on vehicle yaw response / control

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- demonstrate knowledge and understanding of transient vehicle suspension response under applied road inputs and accelerations
- Investigate vehicle handling performance through simulation
- evaluate the effects asymmetric traction forces and the effect on vehicle yaw response / control

INDICATIVE CONTENT

- Transient Vehicle Behaviour and Simulation
 - Load transfer under transient acceleration
 - Modelling of Tyres
 - Driver in the loop simulation
- Spring Mass Damper Systems
 - Suspension damping and damper construction
 - One, two and four degree of freedom suspension models and vehicle response
- Asymmetric drive forces
 - Vehicle mass distribution effects
 - Differentials
 - Vehicle yaw control

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

☒ **Written exam** ☐ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Component 2

☐ **Written exam** ☒ **Coursework** ☐ **Practical**

Mode of assessment	Volume	Weighting
Written Report	3000 words	50%

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	50%
Practical	
TOTAL	100%

AHEP3 Version 3 outcomes to be met:

SM1b, SM2b, EA2, EA3b EA4b, D3b, P1, P3, P4, P8, G1

INDICATIVE READING LIST

Module Code	ACHA6011	
Module Title	Advanced Motorsport Dynamics	
Classification	Reading List entry	Electronic*
Essential	Miliken, W. and Miliken D., Race Car Vehicle Dynamics (SAE,1995)	☒
Essential	Schüetz, Thomas. Aerodynamics of Road Vehicles. Fifth ed. 2016. Print.	☐
Essential	Rowley, W., An Introduction to Race Car Engineering - 3 rd Edition (Rowley Race Dynamics, 2005)	☐
Essential	Segers, Jörg. Analysis Techniques for Racecar Data Acquisition. Second ed. 2014. Print.	☐
Essential	Gillespie, T. D. <i>Fundamentals of Vehicle Dynamics</i> . Warrendale, Pa.: Society of Automotive Engineers, 1992. Print.	☐
Essential	Guiggiani, M., The Science of Vehicle Dynamics 2 nd Edition (Springer 2018)	☐
Further	Bastow D., Howard, G. and Whitehead. J., Car Suspension and Handling - 4 th Edition (Society of Automotive Engineering, 2004)	☐
Further	Dixon, J., Tires, Suspension and Handling - 2 nd Edition (Society of Automotive Engineering, 1996)	☐
Further	Pacejka, Hans. <i>Tire and Vehicle Dynamics</i> . 2nd ed. Elsevier Science, 2005. Web.	☒
Further	Blundell, M. and Harty, D., The Multibody Systems Approach to Vehicle Dynamics (Elsevier Butterworth-Heinemann, 2014)	☐
Further	Jacobson, Bengt. Vehicle Dynamics Compendium. 2017. Web. http://publications.lib.chalmers.se/records/fulltext/225751/local_225751.pdf	☒
Further	McBeath, S., Competition Car Aerodynamics, Haynes (2006)	☐
Further	Proceedings of the Institution of Mechanical Engineers, part D - Journal of Automobile Engineering	☒
Further	Science Direct (Website)	☒

Module Code	ACHA6012
Title	Automotive Materials & Sustainability
Date	17/09/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To enable the student to gain a critical understanding of the principles and potential applications of a range of advanced engineering processes and materials
- To examine the contemporary environmental issues raised by the automotive and motorsport industry.
- To investigate the technical and legislative response available to the governing bodies, teams and manufacturers.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically analyse the structure-property relationships and behaviour of a range of advanced engineering materials and manufacturing processes
- Critically appraise the potential for application of a range of advanced materials and processes in typical engineering applications, gaining an understanding of the development of new sustainable materials for specific applications
- Critically evaluate the impact of current and possible future legislation and public opinion on the operation of motorsport events and the new technologies being proposed and developed by the automotive engineering industry specifically related to sustainability and environmental impact.
- Critically analyse the operation and effectiveness of alternative fuels, electric and hybrid propulsion and energy recovery systems to reduce the environmental impact.

INDICATIVE CONTENT

- Automotive Material Applications
 - Designing for failure (Failure Modes)
 - Phase diagrams and phase transformations
 - Fatigue
 - Characteristics, Applications and Processing of Metal Alloys
 - Characteristics, Applications, and Processing of Polymers
 - Characteristics, Applications, and Processing of Composite Materials
 - Sustainable material alternatives and environmental/social issues
- Life Cycle Analysis
 - Material Extraction and Production
 - Component Manufacture
 - Use Phase
 - End of Life Directive and Vehicle Recycling

- Political and legislative pressures on the industry including Euro emissions legislations and the European drive cycle.
- Emissions legislation within motorsport and the influence of the automotive industry.
- Alternative Fuels for IC engines – bio ethanol, bio butanol, bio diesel, lpg, hydrogen.
- Alternative and Hybrid powertrains and their potential as a sustainable solution.
- Power Generation and infrastructure
- CO2 emission levels and climate change.
- Carbon off setting and mechanisms.
- Noise pollution
- Autonomous & Connected Vehicle Technology

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	3000 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	50%
Practical	
TOTAL	100%

AHEP 3 Version 3 Outcomes to be met:

SM1b, SM3b, EA1b, D1, D2, EL2, EL4, EL6, P1, P2, P4, P5.

INDICATIVE READING LIST

Module Code	ACHA6012	
Module Title	Automotive Materials & Sustainability	
Classification	Reading List entry	Electronic*
Essential	James D et al - <i>Automotive Fuel and Emissions Control Systems</i> , (Prentice Hall, 2008)	☐
Essential	Fuhs A - <i>Hybrid Vehicles</i> , (CRC Press, 2008)	☐
Essential	Singal S P - <i>Noise Pollution and Control</i> , (Narosa Publishing House, 2001)	☐
Essential	Callister, W. D.; Rethwisch, D. G., <i>Materials Science and Engineering</i> - 9th Edition (Wiley, 2014)	☒
Essential	I. Gibson (Ian), D. W Rosen (David W.), B Stucker (Brent) <i>Additive manufacturing technologies: 3D printing, rapid prototyping and direct digital manufacturing</i> Second edition. New York ; London : Springer 2015	☒
Further	Kalpajian, S. and Schmid, S., <i>Manufacturing, Engineering and Technology</i> (Pearson, 2013)	☐
Further	Groover's <i>Principles of Modern Manufacturing</i> – 18 Nov 2016 by Mikell P. Groover	☐
Further	<i>International Journal of Advanced Manufacturing Technology</i> Proceedings of the IMechE	☐
Further	Westbrook M - <i>The Electric Car: Development and Future of Battery, Hybrid and Fuel-cell Cars</i> , (IEE, Power & Energy, 2001)	☐
Further	Heck R M et al - <i>Catalytic Air Pollution Control: Commercial Technology</i> , (Wiley, 2009)	☐
Further	Gordon D & Sperling D - <i>Two Billion Cars: Driving Toward Sustainability</i> (Oxford University Press, 2009)	☐
Further	<i>Race Car Engineering</i>	☒
Further	<i>Race Engine Technology</i>	☒
Further	<i>International Journal of Life Cycle Assessment</i>	☒
Further	http://eemsonline.co.uk (Website for Energy Efficient Motorsport)	☒
Further	http://www.evuk.co.uk (Website For Electric Vehicles UK)	☒
Further	http://www.the-mia.com (Website for the Motorsport Industry Association)	☒

Module Code	ACHA6013
Title	Independent Project
Date	25/06/2020
Level	6
Credits	40
Pre-Requisites	None

AIM(S)

- To develop the ability of students to engage critically and innovatively with theory and/or practice relevant to their studied subject areas in order to produce a discipline specific in-depth project.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Demonstrate intellectual skills in the identification of an appropriate topic, problem or challenge for investigation pertinent to their field of study and formulate a suitable plan for further research utilising relevant investigative methods in order to produce a response.
- Evidence in-depth knowledge and critical understanding of principles necessary to underpin their education within their chosen field of study and problem solving techniques applicable to this.
- Evidence independence of thought and critical evaluation in the production of an independent piece of work, demonstrating transferable skills through exercising initiative and personal responsibility in planning own learning and self-management.
- Organise their knowledge and learning through use of a range of media, and present their work appropriately in a manner that can be understood by specialist and non-specialist audiences.

INDICATIVE CONTENT

- Research paradigms, methods, and techniques of research and enquiry.
- Conducting and writing literature reviews.
- Ethical concerns and the research process.
- Resource, project, and skills management processes and techniques.
- Presenting and illustrating data and information.
- Communication of general, specialist, technical ideas and results.
- Problem solving, creative, entrepreneurial thinking and approaches.
- Collaboration, adaptability and reflection.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	36	9%
Independent learning	364	91%
Placement learning		
TOTAL	400	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Portfolio	Minimum of 3 elements (equivalent to 10,000 words)	100%

Assessment Summary

Activity type	Percentage
Written exam	
Coursework	100%
Practical	
TOTAL	100%

INDICATIVE READING LIST

This will be guided by the student's individual project.

Module Code	ACHA6013	
Module Title	Independent Project	
Classification	Reading List entry	Electronic*
Essential	Cottrell S, (2015) <i>Skills for Success Personal Development and Employability</i> , 3 rd edition, Palgrave. London.	☒
Essential	ASET, 2013 <i>Good Practice Guide for Workbased Learning and Placement Learning in Higher Education</i>	☒
Essential	Gray, D.E. (2018) <i>Doing Real World Research</i> , London: SAGE.	☐
Further	Gallagher K, (2016) <i>Essential Study and Employment Skills For Business and Management Students</i> , Oxford	☐
Further	Gottschall, Jonathan (2013), <i>The Storytelling Animal: How Stories Make Us Human</i> , Houghton Mifflin	☐
Further	Storr, Will (2020), <i>The Science of Storytelling</i> , William Collins	☐
Further	Cohen, L. Manion, L. and Morrison, K. (2017) <i>Research Methods in Education</i> , 8 th edition London: Routledge.	☒
Further	Flick, U. (2014) <i>An Introduction to Qualitative Research</i> , London: SAGE.	☐

Further	Aubrey, K. & Riley, A. (2017) <i>Understanding and Using Challenging Education Theories</i> , London: SAGE.	☒
Further	Brinkmann, S. and Kvale, S. (2018) <i>Doing Interviews (Qualitative Research Kit)</i> . Sage	☐
Further	Gibbs, G. (2018) <i>Analysing Qualitative Data (Qualitative Research Kit)</i> . Sage	☒
Further	Creswell, J. W. (2012). <i>Qualitative inquiry and research design: Choosing among five approaches</i> . Sage	☐
Further	Obschonka, M., Hakkarainen, K., Lonka, K. et al. Entrepreneurship as a twenty-first century skill: entrepreneurial alertness and intention in the transition to adulthood. <i>Small Bus Econ</i> 48 , 487–501 (2017). https://doi.org/10.1007/s11187-016-9798-6	☒
Further	https://ec.europa.eu/jrc/en/entrecomp	☒

MODULE CODE: M6X01290
TITLE: Operations Analysis
DATED: 27/08/2014
LEVEL: 6
CREDITS: 20
JACS CODE: G290

AIM(S)

To introduce the student to business management systems that integrate all facets of the business, including strategic planning, manufacturing scheduling systems, inventory control, order tracking, customer service, capacity planning, transport routing, work measurement and location strategies .

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

1. Critically assess the development and strategic importance of operations management
2. Evaluate operations management techniques and practices necessary to implement and maintain logistical operations.

INDICATIVE CONTENT

- **Development:** Historical background of operational research; identifying strategic information flows; managing explicit and tacit knowledge.
- **Techniques:**
 - Quality control processes and techniques
 - Project management techniques.
 - Labour scheduling
 - Distribution nodes
 - Vehicle scheduling and routing
 - Queuing Theory
 - MRP/MRP2/ERP
 - EOQ/EBQ
 - Customer Service Level
 - Capacity Planning

LEARNING AND TEACHING STRATEGY

Individual topics will be introduced by a weekly lecture of two hours. Lectures will be supported by self-assessment exercises and/or directed study. Seminars, group discussions and workshops.

Allocation of teaching to deliver the module are:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Summative:

Assessment Component 1 – 50%

The assessment will be in the form of an essay that critically appraises the development of operations management and assesses the strategic significance for typical applications. (2,750 words +/- 10%)

Exemplar

Critically appraise the similarities and differences between Total Quality Management, Lean Manufacturing and Business Process Re-Engineering
(Essay 2,750 words +/-10%)

Assessment Component 2 – 50%

The assessment will be in the form of a 2 hour written examination containing four questions from which the student is to attempt two.

Assessment Summary

Activity type	Percentage
Written	50%
Coursework	50%
Practical	0%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	Yes
	No
If yes please provide brief details (no more than 100 words):	

BIBLIOGRAPHY

Essential:

Slack, N. *et al* (2010) Operations Management, Harlow: FT Prentice Hall

Brannick MT et al, (2007), Job and Work Analysis: Methods, Research, and Applications for Human Resource Management, London: Sage

Background:

Lamming, R. (1993) Beyond Partnership: Strategies for Innovation and Lean Supply Harlow: Prentice-Hall

Lysons, K. & Gillingham, M. (2003) Purchasing and Supply Chain Management 6th Edition Harlow: Prentice-Hall

Niebel, BW, (1976), Motion and time study 6th Edition, Arundel: Irwin-Dorsey

Robson, W. (2003) Strategic management and Information Systems: an integrated approach Pitman

Russell, R.S. & Taylor, B.W. (2003) Operations Management Harlow: Prentice-Hall

Whitmore DA, (1975), Work Measurement 2nd Edition, London: Heinemann

Journals:

International Journal of Logistics – Research Applications
International Journal of Physical Distribution and Logistics Management
Chartered Institute of Logistics and Transport - Focus
Chartered Institute of Purchasing and Supply - Supply Management
Management Services
Work Study

Websites:

Chartered Institute of Purchasing and Supply: <http://www.supplymanagement.com/>
Institute for Supply Management: <http://www.ism.ws/>
Enterprise resource planning Knowledge Storm: <http://erp.knowledgestorm.com/>

MODULE CODE:	M6X01291
TITLE:	Human Resource Management (HRM)
DATED:	27/08/2014
LEVEL:	6
CREDITS:	20
JACS CODE:	N600

AIM(S)

- To develop a knowledge of basic principles and concepts of human resource management.
- To enable the student to apply the concepts of human resource management to the logistics industries.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

1. Critically evaluate the nature and scope of human resource management as a business strategy.
2. Critically evaluate the role of employment law, industrial relations and employee development.

INDICATIVE CONTENT

- **Development:** The development of Human Resource Management since the late 19th Century: Welfare; Industrial Relations; Personnel Management, HRM. HRM as a deliberate business strategy
- **Employee Management:** Employee resourcing: the labour market; job analysis; recruitment strategy; selection and recruitment methods. The employment relationship: employment law; labour relations; remuneration and reward strategies
- **Human Capital:** Developing the human resource: the training framework and staff development, work design and employee motivation.

LEARNING AND TEACHING STRATEGY

Individual topics will be introduced by a weekly lecture of two hours. Lectures will be supported by self-assessment exercises and/or directed study. Seminars, group discussions and workshops.

Allocation of teaching to deliver the module are:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%

Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Summative:

Assessment Component 1 – 50%

The assessment will be in the form of an essay that critically appraises the strategic nature of Human Resource Management. (2,750 words +/- 10%)

Exemplar

Compare and critically evaluate the similarities and differences between Personnel Management and Human Resource Management

(Essay 2,750 words +/-10%)

Assessment Component 2 – 50%

The assessment will be in the form of an essay that critically evaluates the role of employment law, industrial relations and employee development in given business related scenarios. (2,750 words +/- 10%)

Exemplar

Critically evaluate the role of industrial relations policies and practices in an industry of your choice.

(Essay 2,750 words +/-10%)

Assessment Summary

Activity type	Percentage
Written	0%
Coursework	100%
Practical	0%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	Yes
	No
If yes please provide brief details (no more than 100 words):.	

BIBLIOGRAPHY

Essential

Beardwell I and Holden L, (2004), Human Resource Management: a contemporary approach, Harlow: FT Prentice Hall

Inman M et al, (2010) Unlocking Human Resource Management, Abingdon: Routledge

Background:

Mullins LY and Christy G, (2013), Management and organisational behaviour, Harlow: FT Prentice Hall [Online Resource]

Schuler RS and Jackson SE, (2007), Strategic Human Resource Management, Oxford: Blackwell

Torrington D et al, (2011), Human resource Management, London: FT Prentice Hall

Journals:

International Journal of Human Resource Studies
Human resource planning: HR

Websites:

<http://www.ilo.org/global/lang--en/index.htm>

<http://www.cipd.co.uk/>

<http://www.hrmagazine.co.uk/>

<http://www.personneltoday.com/>

MODULE CODE: M6X01292
TITLE: Procurement and Contract Law
DATED: 27/08/2014

LEVEL: 6
CREDITS: 20

JACS CODE: J960

AIM(S)

- To develop an appreciation and understanding of the application of procurement policies.
- To understand the general principles of contract law to logistics and supply chain operations.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- Critically evaluate the procurement policies and approaches to the management of suppliers.
- Demonstrate a critical understanding of the contract law of England and Wales in the context of the logistics industries.

INDICATIVE CONTENT

- **The different types of procurement:** capital buying, buying services, commodity buying, buying for resale, international purchasing, retail buying and buying specialist products/services eAuctions, Reverse Auctions; Tendering exercises
- **Procurement Performance:** Monitoring, evaluating and measuring the performance of the purchasing departments; the cost versus price argument and total acquisition cost; Discounted pricing
- **Globalisation:** The sourcing process including single versus multiple sourcing, global sourcing and the case for local versus global purchasing; INCOTERMS; OJEC regulations
- **Vendor/Supplier Rating:** Supplier selection, rating, evaluation and auditing; Role of standby suppliers in 21st Century
- **Sustainability:** Environmental Issues in Procurement
- **Contract Law:**
 - Formation and scope of a contract: agreement, consideration, certainty, intention to be legally bound, form, and probity.
 - Mitigating factors: mistake, misrepresentation, duress and undue influence.
 - Illegality: contracts illegal at common law, statutory illegality, consequences of illegality, contracts in restraint of trade.
 - Contents of contract: express and implied terms, collateral contracts, conditions, warranties and in nominate terms, exemption clauses.
 - Performance and breach: substantial performance, repudiation and anticipatory breach, discharge by breach, discharge under the doctrine of frustration.

- Remedies for breach of contract: assessment of damages, remoteness of damages for non-financial loss, mitigation, liquidated damages, penalties and specific performance.

LEARNING AND TEACHING STRATEGY

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Essay	2,750 words $\pm$ 10%	50%

Assessment Component 2

(Tick one)

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Examination	2 hours	50%

Assessment Summary

Activity type	Percentage
Written exam	50%
Coursework	50%
Practical	0%
TOTAL	100%

READING LIST

Module Code	M6X01292	
Module Title	Procurement and Contract Law	
Classification	Reading List entry	Electronic*
Essential	Bailey P et al, (2008), Procurement, Principles and Management, London: FT Prentice Hall	☐
Essential	Stone R, (2013), The modern law of contract 10th Edition, London: Routledge	☐
Essential	Martin J and Turner C, Key Facts: Contact Law, Abingdon: Hodder Education	☐
Further	Atiyah PS et al, (2001), The Sale of Goods, Harlow: Longman	☐
Further	Elliot C and Quinn F, (2001), Contract Law, Harlow: Longman	☐

Further	Lysons, K. & Gillingham, M. (2003) Purchasing and Supply Chain Management 6th Edition Harlow: Prentice-Hall	☐
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MODULE CODE: M6X01293
TITLE: Dissertation
DATED: 27/08/2014
LEVEL: 6
CREDITS: 40
JACS CODE: J990

AIM(S)

- To enable the student to produce a substantial body of work which has been instigated, developed and produced as a consequence of their own initiative, and which offers opportunities for specialism.
- To provide the student with the opportunity to apply a range of analytical skills and techniques.
- To develop the student's skills in undertaking a structured and methodical research project.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

1. Identify, develop and define a research aim.
2. Plan, manage and execute a series of objectives related to the in-depth investigation of a relevant logistics management related concept or problem.
3. Undertake a critical review of current literature.
4. Complete the production of a technically competent and professionally written report that incorporates explicit objectives and supported and justifiable conclusions.

INDICATIVE CONTENT

- Theoretical considerations in research.
- Planning and starting research.
- Survey research design. Experimental research design.
- Pilot schemes, feasibility studies and prototype research.
- Defining objectives and choosing methodologies.
- Analytical methods and techniques. Data and information presentation.
- Cognitive reasoning.

LEARNING AND TEACHING STRATEGY

The indicative content shown below will be introduced by research method lectures with specific reference to project management, research structure and report format.

Guidelines will also be given to students at appropriate stages throughout the year by lecturers, seminars and discussions with thesis supervisors.

The Research Methodology module of Level Five will provide the student with the ability to use a range of analytic and statistical techniques.

Allocation of teaching to deliver the module are:

Activity type	Hours	Percentage
Scheduled learning	10	2.5%
Independent learning	390	97.5%
Placement learning	0	0%
TOTAL	400	100%

ASSESSMENT

Formative:

The continued development of the Personal Development Plan as an aid to the development of suitable methodologies and a means of conducting research culminating in the production of a research proposal in report format, to be delivered by the end of October in the Autumn Term, that defines the proposed research aim. (1,000 words +/- 10%)

Summative:

Assessment Component 1 – 30%

The assessment will be in the form of an essay that undertakes a critical review of current literature pertaining to the research aim to be delivered by the end of February in the Spring Term (2,750 words +/- 10%).

Assessment Component 2 – 70%

The assessment will be in the form of a technically competent and professionally written report that:

1. Reflects the pathway the student is studying;
- and
2. Incorporates explicit objectives and supported and justifiable conclusions to be delivered on a date to be notified by the Programme Director.

Assessment Component 1 forms the Literature Review chapter of this work and is included in the anticipated word count (12,000 words +/- 10%).

Assessment Summary

Activity type	Percentage
Written	0%
Coursework	100%
Practical	0%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	Yes
	No
If yes please provide brief details (no more than 100 words):. Sustainability may be addressed by the student to differing degrees dependent upon the subject area; supervising tutors will make every effort to encourage the student to identify sustainability issues impacting upon their chosen research area.	

BIBLIOGRAPHY

Essential:

Cottrell S, (2014), Dissertations and project reports: a step by step guide, Basingstoke: Palgrave Macmillan

Field A, (2009), Discovering statistics using SPSS: (and sex, drugs and rock 'n' roll), London: SAGE

Background:

Denscombe M (2010), The good research guide: for small-scale research projects, Maidenhead: McGraw-Hill OUP

Mason J, (2002), Qualitative researching 2nd Edition, London: SAGE

Robson C, (2011), Real world research: a resource for users of social research methods in applied settings, Chichester: Wiley

Yin RK, (2009), Case study research: design and methods, London: SAGE

MODULE CODE: M6X01296
TITLE: Motorsport Events Management
DATED: 27/08/2014
LEVEL: 6
CREDITS: 20
JACS CODE: N820

AIM(S)

- To develop an understanding of the importance of events management to motorsport.
- To critically examine current theories and practices in event management.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

1. Critically appraise the organisation and management of motorsport events.
2. Demonstrate an ability to plan a motorsport event.

INDICATIVE CONTENT

- **Concepts of event management:** society and sports theory: positive and negative impacts of events. Polity and events, nationality, political objectives and the role of elites. Social, economic and environmental issues and impacts, community and cultural impacts.
- **Event Planning:** The historical development and maintenance of safe operations in motorsport. Business and event planning, project management techniques and tools. Assessing risk, health and safety management. Sustainable events (Glastonbury)
- **Event Management:** Management and organisation of events, marketing, sponsorship, and volunteerism. Event management models, event logistics and human resource planning.

LEARNING AND TEACHING STRATEGY

Individual topics will be introduced by a weekly lecture of two hours. Lectures will be supported by self exercises and/or directed study. Seminars, group discussions and workshops will be used to develop ideas, concepts and practical applications.

Allocation of teaching hours to deliver the module are:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Formative:

The assessment will be in the form of a presentation of no more than 5 minutes duration in support of Assessment Component 2

Summative:

Assessment Component 1 – 50%

The assessment will be in the form of an essay that identifies and critically reviews the conduct of a motorsport event. (2,750 words +/- 10%)

Exemplar

Is the era of the volunteer marshal coming to an end? Critically appraise the extent to which the motorsport industry is encouraging and training new entrants in the role.

(Essay 2,750 words +/-10%)

Assessment Component 2 – 50%

The assessment will require the student to produce a portfolio of evidence that demonstrates an ability to plan a motorsport event. (5 to 6 portfolio components)

Exemplar

Produce a report and short presentation (no more than 5 minutes) detailing the plan for an event or a significant part of an event such as the erection of temporary seating; activity within a parc ferme; supporting event such as a fun fair

- Develop a business plan
- Prepare a project plan

(Report 1,750 words +/-10%)

Assessment Summary

Activity type	Percentage
Written	0%
Coursework	100%
Practical	0%
TOTAL	100%

EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Does the module contribute to ESD?	Yes
	No
If yes please provide brief details (no more than 100 words):.	
Sustainability is a significant factor in motorsport as evidenced in the Indicative Content	

BIBLIOGRAPHY

Essential:

Fenich, G. (2011), Meetings, Expositions, Events & Conventions, Harlow: Prentice Hall

Getz, D. (2007), Event Studies: Theory, Research and Policy, Oxford: Butterworth-Heinemann

Background:

Beech, J and Chadwick, S, (2004), The Business of Sport Management, Harlow: Prentice Hall

Bowdin, G (2010), Events Management, Oxford: Butterworth

Coakley, J (2009), Sports in Society: Issues and Controversies Maidenhead: McGraw-Hill

MSA (2005), Motor Sports Association: MSA Competitors' Handbook

Wolsey, C. (2001), Understanding the Leisure and Sport Industry, Harlow: Longman

Journals:

Racecar Engineering

Autosport

MotorSport

Motorsport News

Journal of Sport Management

Sociology of Sport Journal

Festival Management and Event Tourism

Event Management; An International Journal

Websites:

<http://www.msauk.org/>

<http://www.the-mia.com/>

<http://www.thepaddockmagazine.com/>

<http://www.autosport.com/>

<http://www.motorsportmagazine.co.uk/>

<http://www.silverstone.co.uk/events/>

<http://www.fia.com/>

http://www.bbc.co.uk/news/business/business_of_sport/

<http://news.bbc.co.uk/sport1/hi/motorsport/default.stm>