

MODULE DIRECTORY

LEVEL 5

SCHOOL OF ENGINEERING

FACULTY OF SCIENCE AND ART

2026-2027

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INTRODUCTION

This Module Directory includes all the modules for Level 5 within the School of Engineering in the academic year 2026-2027.

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 School/Faculty. 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 Faculty 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	ACHA5016
Title	Advanced Automotive Surfacing
Date	05/05/2021
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To develop competence and proficiency in the use of surfacing modelling software in the detailing of design solutions and the production of technical and realistic output formats for design consideration

LEARNING OUTCOMES

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

- Use advanced 3D surface modelling tools to create realistic design solutions within a structured modelling workflow and understanding of render workflow and render control.
- Apply an understanding of tolerance setting for data transfer to prototype modelling software; demonstrating knowledge of CNC and Rapid Prototyping data protocols.

INDICATIVE CONTENT

- Modelling Strategies
- Curve evaluation tools
- Surface Workflow & Continuity: Theory and Practice
- Rendering types and render management
- CNC/Rapid prototyping data transfer practice
- A Class surfacing
- Sub D modelling
- Animation 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

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Advanced Surface modelling and visualisation of a vehicle	2400 words equivalent	60%

Assessment Component 2

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Design for Prototyping	1600 words equivalent	40%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACHA5016	
Module Title	Advanced Automotive Surfacing	
Classification	Reading List entry	Electronic*
Essential	https://knowledge.autodesk.com/support/alias-products/learn	☒
Essential	Alias Learning Tools (2006) <i>Learning Design with Alias Studio Tools</i> . John Wiley & Sons.	☐
Essential	www.autodesk.com	☒
Further	www.carbodydesign.com	☒
Further	https://danielsimon.com/	☒
Further	https://www.behance.net/search/projects?field=automotive%20design	☒
Further	Cardesignnews.com	☒
Essential	https://www.youtube.com/c/HandleBar3D/videos	☒

Module Code	ACHA5017
Title	Advanced Digital Visualisation
Date	05/05/2021
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To develop advanced knowledge, understanding and skills in the use of 2D digital computer visualisation techniques for the development and communication of industrial design proposals.

LEARNING OUTCOMES

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

- Understand and apply advanced digital visualisation techniques using industry standard software platforms.
- Create high quality imagery to effectively represent and communicate design intentions at varying stages of the automotive and transport design process.

INDICATIVE CONTENT

- Adobe Photoshop & Illustrator
- Image Manipulation and Masks
- Layer Effects and Manipulation
- Creating Custom Brush Sets
- Autodesk Alias & Sub D Modelling.
- Using Geometry for Sketching
- Working With Canvases in 3D Environment
- Canvas Sketch Projection onto 3D Geometry

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

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Portfolio	Design Visualisation Portfolio equivalent to 4000 words.	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACHA5017	
Module Title	Advanced Digital Visualisation	
Classification	Reading List entry	Electronic*
Essential	https://knowledge.autodesk.com/support/alias-products/learn	☒
Essential	Faulkner A., Chavez C. (2019) <i>Adobe Photoshop Classroom in a Book</i> . Adobe.	☐
Further	http://www.carbodydesign.com/tutorials/2d/sketchbook-pro-tutorials	☒
Further	https://www.behance.net/search/projects?field=automotive%20design	☒
Essential	Robertson, S. (2014) <i>How to render: the fundamentals of light, shadow and reflectivity</i>	☐
Essential	Robertson, S. (2013) <i>How to draw: drawing and sketching objects and environments</i>	☐
Further	https://www.youtube.com/c/HandleBar3D/videos	☒

Module Code	ACHA5018
Title	Changemakers: Building your Personal Brand for Sustainable Employment
Date	25/06/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To build the skills and competencies necessary for career resilience and professional development for the future work context.

LEARNING OUTCOMES

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

- Evaluate personal employability skills and their congruence with the skills required for professional practice in a real or simulated environment.
- Build a personal brand and promote a professional identity for a specific opportunity.

INDICATIVE CONTENT

- Analysing your employment sector in order to identify problems, gaps in the market and how you can add value for sustainable employability.
- Building your brand and promoting a professional identity through personal skills analysis and personal development planning.
- Contemporary technologies: developing an online personal presence (e.g. basic website building/social media/blogs/vlogs etc.).
- Search techniques for employment/self-employment opportunities.
- Adopting project management approaches (defining the problem; setting the goals and objectives, milestones and monitoring, evaluation).
- Collaboration, networking, building social capital, negotiation and influencing.
- Awareness, emotional intelligence, well-being and resilience.
- Ethics, values, diversity, inclusion, intercultural awareness and responsible stewardship: issues, challenges and actions.
- Cultural and linguistic expression.

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		
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Online portfolio	2,000 words or equivalent	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Assignment	2,000 words or equivalent	50%

Assessment Summary

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

INDICATIVE READING LIST

This will be guided by the student's subject area.

Module Code	ACHA5018	
Module Title	Changemakers: Building your Personal Brand for Sustainable Employment	
Classification	Reading List entry	Electronic*
Essential	Lock, D. (2018). <i>Project management</i> . Routledge	☒
Essential	Dweck, C. (2017) <i>Mindset: Changing The Way You think To Fulfil Your Potential</i> . Robinson Publishers.	☒
Essential	Griffith, B.A. (2014) <i>Working in Teams: Moving From High Potential to High Performance</i> . SAGE Publications Inc.	☒
Essential	Baguley, P. (2003). <i>Teams and team-working</i> (New ed.). London: Teach Yourself.	☐
Essential	Gensler, H. J. (2017). <i>Ethics : A contemporary introduction</i> (3rd ed., Routledge contemporary introductions to philosophy). New York: Routledge.	☐
Essential	Well-being of Future Generations (Wales) Act 2015 (Online). Available at http://www.legislation.gov.uk/anaw/2015/2/contents/enacted	☒
Further	Smale, B. and Fowlie, J. (2015) <i>How to Succeed at University an Essential Guide to Academic Skills and Personal Development</i> (2nd Ed.). Los Angeles, [Calif.]: SAGE Study Skills Ser. Web.	☒
Further	Phillips, S. (2014) <i>The complete guide to professional networking : the secrets of online and offline success</i> .	☒

	London, England : Kogan Page	
Further	Snow, S. (2018) <i>Dream Teams: Working Together Without Falling Apart</i> . Piatkus.	☒
Further	Williams, B. (2020) <i>Diversity in the Workplace: Eye-Opening Interviews to Jumpstart Conversations about Identity, Privilege, and Bias</i> . Rockridge Press	☒
Further	Dawson, P. and Andriopoulos, C. (2017) <i>Managing Change, Creativity and Innovation</i> . SAGE Publications Ltd.	☒
Further	Clements, P., & Jones, J. (2008). <i>The diversity training handbook a practical guide to understanding & changing attitudes</i> (3rd ed.). London ; Philadelphia: Kogan Page.	☒

Module Code	ACHA5019
Title	Changemakers: Creativity and Value Creation
Date	25/06/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To develop the concepts and practice of creativity and value creation for the development of innovative, aspiring and progressive solutions.

LEARNING OUTCOMES

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

- Demonstrate knowledge and critical understanding of innovation, creativity and enterprising mindset, recognising the values and the contribution creativity makes to the common good.
- Conceive, articulate and apply creative thinking within a work-based or academic context to develop novel solutions and/or value creation.

INDICATIVE CONTENT

- Creativity in theory and practice.
- Value creation in theory and practice.
- Creative and ethical leadership: skills and challenges.
- Driving innovation and change, the intra and entrepreneurial individual.
- Critical thinking, troubleshooting and problem solving, developing novel solutions.
- Information gathering for inspiration, vision creation and ideation.
- Developing the enterprising and data driven mindset.
- Contemporary technologies: virtual and augmented reality and artificial intelligence to enhance creativity and innovation.
- Time management practices for an entrepreneurial mindset.
- Being resourceful, in the context of making do with less.
- Reflection and self-reflection.

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		
TOTAL	200	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Online portfolio of set exercises	2,000 words or equivalent	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Assignment	2,000 words or equivalent	50%

Assessment Summary

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

INDICATIVE READING LIST

This will be guided by the student's subject area.

Module Code	ACHA5019	
Module Title	Changemakers: Creativity and Value Creation	
Classification	Reading List entry	Electronic*
Essential	Hargreaves, J., and Page, L. (2013) <i>Reflective Practice</i> . (Key Themes in Health and Social Care Series). Polity Press.	☒
Essential	Nardi, P.M. (2017) <i>Critical Thinking : Tools for Evaluating Research</i> . University of California Press	☒
Essential	Westerman, G., Bonnet, D. and McAfee, A., <i>Leading Digital: Turning Technology Into Business Transformation</i> . (Audiobook) Recorded Books. 2017.	☒
Further	Schiuma, G. (2011) <i>Managing Knowledge Assets and Business Value Creation in Organizations : Measures and Dynamics</i> Hershey, Pa.: Business Reference Service	☒
Further	Rescher, N. (2014). <i>A System of Pragmatic Idealism, Volume II The Validity of Values, A Normative Theory of Evaluative Rationality</i> (Princeton Legacy Library). Princeton: Princeton University Press.	☒
Further	Turner, E. (2020) <i>Be Less Zombie: How great companies create dynamic innovation, fearless leadership and passionate people</i> . John Wiley & Sons.	☒

Module Code	ACHA5020
Title	Independent Professional Placement
Date	05/05/2021
Level	5
Credits	0
Pre-Requisites	None

AIM(S)

- To introduce the student to real experience of the commercial context of the creative industry in terms of business environments including: interpersonal skills, management organisation and administration, regulation and legislation, finances and marketing within applied creative practice.

LEARNING OUTCOMES

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

- Show detailed knowledge and advanced understanding of the relationship between a creative organisation and the commercial, socio-economic and environmental context in which it is found.
- Apply subject specific skills and cognitive skills in recognising and evaluating creative methods, planning, marketing, costing and monitoring projects, motivational approaches and team dynamics.
- Take personal responsibility for the development of key transferable skills in self-management, organisational skills, leadership and decision making, self-reflection and communication skills.

INDICATIVE CONTENT

- Business organisation and the commercial environment.
- The creative industries in the UK and global economy.
- Sustainable practices.
- Regulation and legislation.
- Business ethics and the designer's responsibility to society.
- Management and leadership.
- Financial management.
- Marketing.
- Project planning and management.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	-	-
Independent learning	-	-
Placement learning	600	100%
TOTAL	600	100%

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Placement Portfolio	6 elements, or equivalent	75%

Assessment Component 2

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	2000 words	25%

Note: this sandwich placement is not awarded a mark. It is either Pass or Fail

Assessment Summary

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

INDICATIVE READING LIST

Specific to the requirements of the placement provider and activities of the student as agreed with the Placement Coordinator.

Module Code	ACHA5021
Title	Professional Practice 1
Date	05/05/2021
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To develop the contextual and detailed design development skills in the generation of conceptual product, automotive and transportation solutions and strengthen both traditional and digital techniques appropriate for effective design development and professional communication.

LEARNING OUTCOMES

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

- Apply design development methods in the form of idea generation, concept development and realisation to given design opportunities;
- Evaluate design statements with objectivity and communicate the resulting proposals effectively through 2D and 3D media;
- Apply a sound knowledge and understanding of the product/vehicle's aesthetics, user interaction, architecture and enabling technology in a manner appropriate to their specific award pathway.

INDICATIVE CONTENT

- Design integration
- Design evaluation
- Design validation
- Design realisation

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

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Design Project	3200 words equivalent	80%

Assessment Component 2

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Design Project	800 words equivalent	20%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACHA5021	
Module Title	Professional Practice 1	
Classification	Reading List entry	Electronic*
Essential	Dan Cuffaro, (2013) <i>The Industrial Design Reference & Specification Book: Everything Industrial Designers Need to Know Every Day</i>	☐
Essential	Design Studio Press, Stuart Macey (2014) H POINT	☐
Further	https://www.behance.net/search/projects?field=automotive%20design	☒
Further	Danielsimon.com	☒
Further	Sydmead.com	☒
Further	Cardesignnews.com	☒
Further	Carbodydesign.com	☒

Module Code	ACHA5022
Title	Professional Practice 2
Date	05/05/2021
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To provide experience of working within a group environment, in liaison, where possible, with an industrial partner, in order to design a product, vehicle, system or service.
- To provide the students with an opportunity to experience group dynamics and develop communication and project management skills to a professional standard.

LEARNING OUTCOMES

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

- Identify problems, contribute solutions and communicate appropriate outcomes in a considered and professional manner;
- Work as a member of a multidisciplinary team in achieving a set of shared objectives as defined by the scope of the project.

INDICATIVE CONTENT

- Decision-making & Problem solving techniques
- Project planning & management
- Design communication
- Professional awareness

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

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Design Project	4000 words equivalent	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACHA5022	
Module Title	Professional Practice 2	
Classification	Reading List entry	Electronic*
Essential	Dan Cuffaro, (2013) <i>The Industrial Design Reference & Specification Book: Everything Industrial Designers Need to Know Every Day</i>	☐
Essential	Stuart Macey (2014), <i>H POINT</i> . Design Studio Press	☐
Further	https://www.behance.net/search/projects?field=automotive%20 design	☒
Further	Danielsimon.com	☒
Further	Sydmead.com	☒
Further	Cardesignnews.com	☒
Further	Carbodydesign.com	☒

Module Code	ACHA5028
Title	Motorcycle Data Acquisition
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To equip students with the knowledge and skills to understand and apply data acquisition techniques in motorcycle engineering. It focuses on sensor types, data collection, and analysis methods to improve motorcycle performance and safety. By the end, students should be capable of designing, implementing, and interpreting data from motorcycle data acquisition systems for optimal motorcycle setup and performance enhancement.

LEARNING OUTCOMES

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

- apply appropriate data acquisition technologies, including sensor selection and signal processing, to analyse motorcycle performance and inform setup and design decisions;
- interpret and evaluate data using motorcycle-specific software tools to justify engineering adjustments that enhance vehicle handling and performance.

INDICATIVE CONTENT

- Data Acquisition Systems:
 - Overview of components, data loggers, video capture, data analysis software, inertial measurement platforms and the role in motorcycle performance and safety.
- Motorcycle Sensors:
 - Selection, installation, calibration of sensors (speed, acceleration, bank angle, suspension travel) including accelerometers, gyroscopes, GPS, temperature sensors, strain gauges, TPMS, loggers and cameras.
- Data Management:
 - The use of effective setup sheets, rider feedback recording and analysis, chassis and geometry calculations, component milage and holistic data management.
- Data acquisition system design:
 - Designing a data acquisition system for a motorcycle, including sensor selection, installation, and calibration. Understanding CAN communication and issues related to data storage, sampling rate, and data transfer.
- Data analysis:
 - Techniques for analysing data, including filtering, statistical analysis, and graphical presentation of results. Interpretation of data to identify areas for improvement in motorcycle performance and safety.

- Motorcycle Performance Analysis:
 - Analysing performance data, understanding the impact of various factors (rider input, road conditions, environmental factors) on motorcycle performance.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam
 ☐ Coursework
 ☒ Practical

Mode of assessment	Volume	Weighting
Extended Practical	8 hours	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C3: Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed

C6: Apply an integrated or systems approach to the solution of complex problems.

C12: Use practical laboratory and workshop skills to investigate complex problems.

C16: Function effectively as an individual, and as a member or leader of a team.

INDICATIVE READING LIST

Module Code	ACHA5028	
Module Title	Motorcycle Data Acquisition	
Classification	Reading List entry	Electronic*
Essential	Bradley, J. (2018) <i>The racing motorcycle. Volume 3, An introduction to chassis set up</i> . Malvern. Broadland Leisure Publications.	☐
Essential	Trapani, M et al., (2020) <i>A practical guide to race motorbike electronics</i> , Independently published	☒
Further	Spalding, N. (2019) <i>MotoGP technology</i> . Tunbridge Wells: Phoebus Apollo Publishing Limited.	☐

Further	Trapani, M. (2024) <i>Introduction to race motorbike torque management</i> . Italy Independently published.	☐
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Module Code	ACHA5029
Title	Motorcycle Dynamics
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To immerse students in the technical intricacies of motorcycle dynamics, focusing on the fundamental principles and dynamic behaviour of motorcycles in motion. It intends to equip students with a comprehensive understanding of how motorcycles react under various conditions in automotive and competitive settings, enabling them to optimise motorcycle setup and performance effectively.

LEARNING OUTCOMES

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

- analyse wheel loads, load transfer, and cornering behaviour to evaluate motorcycle stability and setup under a range of dynamic conditions;
- apply principles of vehicle dynamics to interpret motorcycle behaviour and develop recommendations that improve handling and performance.

INDICATIVE CONTENT

- Fundamentals of Motorcycle Dynamics
 - Principles of motion and forces, wheel load analysis, and weight distribution's impact.
- Load Transfer Analysis
 - Effects of longitudinal acceleration on stability and performance, optimizing suspension setup for ideal load transfer.
- Cornering Performance
 - Analysis of lean angles, factors influencing cornering, tire selection and pressure for optimal performance.
- Suspension Design and Dynamics
 - Role of suspension in dynamics, types and components, suspension design principles, effects of adjustments on dynamics.
- Modelling Suspension Systems
 - The role of differential equations in representing the dynamics of mass-spring-damper systems and their application.
- Power Transmission and Braking Systems
 - Analysis of power transmission for performance, impact of braking systems on stability and control.
- Application in Design and Performance

- Integrating dynamics principles in design to optimize performance, including aerodynamics and weight reduction strategies.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

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

Mode of assessment	Volume	Weighting
Exam	2 hours	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C3: Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed.

C12: Use practical laboratory and workshop skills to investigate complex problems.

INDICATIVE READING LIST

Module Code	ACHA5029	
Module Title	Motorcycle Dynamics	
Classification	Reading List entry	Electronic*
Essential	Cossalter, V. (2006) <i>Motorcycle dynamics</i> . 2nd English ed. Lulu.	☐
Further	Bradley, J., (2003) <i>The Racing Motorcycle: A Technical Guide for Constructors volumes 1 and 2</i> , Malvern Broadband Leisure Publications	☐

Further	Spalding, N. (2019) <i>MotoGP technology</i> . Tunbridge Wells: Phoebus Apollo Publishing Limited.	☐
Further	Foale, T. (2002) <i>Motorcycle handling and chassis design : the art and science</i> . England: Tony Foale.	☐
Further	Zhang, Y. and Mi, C. (2018) <i>Automotive power transmission systems</i> . Hoboken, NJ: John Wiley & Sons Ltd.	☒

Module Code	ACHA5030
Title	Motorsport Data Acquisition and Dynamics
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To equip students with the knowledge and skills to evaluate vehicle dynamic performance and handling balance through the application of fundamental dynamic principles and the use of data acquisition techniques.

LEARNING OUTCOMES

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

- demonstrate a critical understanding of vehicle dynamics, focusing on analysing wheel loads, evaluating cornering performance, and understanding load transfer during accelerations to optimise motorsport vehicles;
- critically evaluate motorsport vehicle performance by the application of appropriate data acquisition technologies.

INDICATIVE CONTENT

- Vehicle Dynamics:
 - suspension as a kinematic system
 - tyre performance and control.
 - load transfer under longitudinal and lateral acceleration.
 - steady state vehicle balance.
 - Influence of roll stiffness distribution on vehicle wheel loads and grip.
- Data acquisition:
 - Analysis of vehicle data collected using data acquisition.
 - Track testing methods and standards.
 - Evaluation of performance of vehicles through data interpretation.
 - Math Channels and Setup Sheets.
 - Data acquisition system specification and design.
 - Sensor types and applications.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Technical Report / Paper	2500 Words	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C3: Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed.

C5: Design solutions for complex problems that meet a combination of societal, user, business, and customer needs.

C12: Use practical laboratory and workshop skills to investigate complex problems.

C16: Function effectively as an individual, and as a member or leader of a team.

INDICATIVE READING LIST

Module Code	ACHA5030	
Module Title	Motorsport Data Acquisition and Dynamics	
Classification	Reading List entry	Electronic*
Essential	Bastow, D., Howard, G. and Whitehead, J.P. (2004) <i>Car suspension and handling</i> . 4th ed. Bury St. Edmunds: Professional Engineering Publishing.	☐
Essential	Gillespie, T.D. (1992) <i>Fundamentals of vehicle dynamics</i> . Warrendale, Pa: Society of Automotive Engineers.	☐
Essential	Hillier, V.A.W., Calex UK, editor and Institute of the Motor Industry. (2014) <i>Hillier's fundamentals of motor vehicle technology. Book 1</i> . Sixth edition / revised by Calex UK. Oxford: Oxford University Press.	☐
Essential	Guiggiani, M. (2018) <i>The science of vehicle dynamics : handling, braking, and ride of road and race cars</i> . Second edition. Cham, Switzerland: Springer.	☐

Essential	Milliken, W.F. and Milliken, D.L. (1995) <i>Race car vehicle dynamics</i> . Warrendale, Pa: Society of Automotive Engineers.	☐
Essential	Schüetz, T. (2016) <i>Aerodynamics of road vehicles</i> . Fifth edition. Warrendale: SAE International.	☒
Further	Jacobson, B.J.H. (2020) <i>Vehicle Dynamics Compendium</i> .	☒
Further	Pacejka, H.B. and Besselink, I. (2012) <i>Tire and vehicle dynamics</i> . 3rd ed. Amsterdam ; Elsevier/BH.	☒
Further	Rowley, W. (2004) <i>An introduction to race car engineering</i> . 3rd ed. Canada Rowley Race Dynamics.	☐

Module Code	ACHA5032
Title	Numerical Computation
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To integrate numerical computation with automotive engineering, emphasising the use of coding environments. It focuses on applying numerical methods to automotive issues such as vehicle dynamics, powertrain optimization, and safety simulations, equipping students with the skills to implement these methods in various coding suits and develop simulation and data analysis applications.

LEARNING OUTCOMES

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

- demonstrate knowledge and critical understanding of key statistical and numerical methods and apply core mathematical and engineering principles to the analysis and solution of complex problems using coding-based algorithms;
- select and apply appropriate analytical and computational techniques, such as root solving and statistical inference to model real-world problems, critically evaluating the suitability and limitations of each approach;
- use programming environments to conduct practical investigations, including the handling of numerical data and implementation of algorithmic solutions, while developing transferable problem-solving skills in a computing context.

INDICATIVE CONTENT

- Programming Foundations: Introduction to Python and MATLAB, focusing on constructs and data structures for numerical analysis.
- Optimisation of Code: using different numerical methods and coding techniques to run code on tasks such as root finding to work efficiently concerning time and hardware.
- Artificial Intelligence: The role of generative AI in computational mathematics and coding and its limitations, this will cover the power of matrices to solve complex problems efficiently on hardware.
- Numerical Methods Application: Solving equations, optimization, and differential equations in automotive contexts such as engine calibration and vehicle dynamics.
- Automotive System Simulations: Modelling and simulation in Python and MATLAB for powertrains, suspension, and thermal management.
- MATLAB App Designer: Creating user-friendly applications for automotive engineering analysis and visualization.

- CFD and FEA in Automotive: Basics and applications of CFD and FEA for aerodynamics, cooling system design, and structural analysis.
- Vehicle Dynamics and Control Systems: Mathematical modelling and simulation for vehicle motion, including stability and control system design.
- Thermal Systems Modelling: Numerical analysis and simulation of automotive thermal systems, such as engine cooling and battery management.
- Statistical Methods: Use code to efficiently analyse data and draw statistical conclusions. Also, its role as the backbone of the Monte Carlo method and AI computation.
- Design of Experiments: Use code to efficiently analyse data and draw future experimental method plans.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Portfolio	3 Elements	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C3: Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed.

C12: Use practical laboratory and workshop skills to investigate complex problems.

INDICATIVE READING LIST

Module Code	ACHA5032	
Module Title	Numerical Computation	
Classification	Reading List entry	Electronic*
Essential	Gilat. A, & Subramaniam, V.(2014). <i>Numerical Methods for Engineers and Scientists: An Introduction with Applications using MATLAB.</i> " 3rd Edition, New Jersey. Wiley.	☐
Further	Oliphant, K. Travis. (2017) <i>Python for Scientists and Engineers</i> . First Edition, London Continuum Press,	☐
Further	Moore, H. (2019) <i>MATLAB® for engineers</i> . Fifth edition. New York: Pearson.	☐
Further	Antonioni, A., & Wu-Sheng, Lu., (2017) <i>Optimization in Engineering: Models and Algorithms</i> . New York. Springer	☐
Further	Moaveni, S.(2014) <i>Finite Element Analysis: Theory and Application with ANSYS</i> . 4th Edition, London Pearson,	☐

Module Code	ACHA5033
Title	Performance Internal Combustion Engines
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide an in-depth study of internal combustion engines, emphasising design, performance, and emissions control. It covers the principles of cylinder-head and valve-train design, combustion performance analysis, and their impacts on engine efficiency and emissions. Students will learn to evaluate engine technology, analyse performance, and optimise models for efficiency and legislative compliance.

LEARNING OUTCOMES

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

- apply principles of cylinder-head and valve-train design to analyse their influence on engine performance and emissions;
- evaluate the efficiency and emissions performance of internal combustion engines by analysing intake and exhaust systems, including pulse tuning and flow characteristics.

INDICATIVE CONTENT

- Power-Producing Components: Design and impact on performance, dynamics of piston, con-rod, crankshaft and the effects of component design on the engine.
- Cylinder-Head and Flow Analysis: Explore the role of cylinder-head design in engine efficiency and performance, including flow bench testing, evaluation and analysis.
- Engine Performance Analysis: Combustion processes, including ignition, flame propagation, and burn rate, efficiency factors, performance measurement techniques.
- Heat Exchanger Design: Fundamentals, automotive applications, heat transfer effectiveness and optimisation for different types of heat exchangers, including radiators and intercoolers.
- Emissions and Performance Requirements: Legislative requirements for emissions control and their impact on engine design, trade-offs and emissions reduction technologies.
- Valve-Train and Camshaft Analysis: Design principles; Analyse the relationship between camshaft design and valve timing events, valve velocity, acceleration, and contact forces.
- Manifold Analysis: Design and optimization of exhaust and intake manifolds, pulse tuning effects, CFD and experimental testing for engine performance optimisation.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Laboratory Book	2500 Words	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C5: Design solutions for complex problems that meet a combination of societal, user, business, and customer needs.

C7: Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts.

C12: Use practical laboratory and workshop skills to investigate complex problems.

C13: Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations.

INDICATIVE READING LIST

Module Code	ACHA5033	
Module Title	Performance Internal Combustion Engines	
Classification	Reading List entry	Electronic*
Essential	Heywood, J. (2018) <i>Internal combustion engine fundamentals</i> . 2nd edition. New York, N.Y: McGraw-Hill Education.	☒

Essential	Turns, S.R. and Pauley, L.L. (2020) <i>Thermodynamics : concepts and applications</i> . Second edition. Cambridge: Cambridge University Press.	☐
Further	Robert Bosch GmbH. (2022) <i>Automotive handbook</i> . 11th edition. Postfach, Karlsruhe: Robert Bosch GmbH.	☒
Further	Magrab, E.B. <i>et al.</i> (2000) <i>An engineer's guide to MATLAB</i> . Upper Saddle River, N.J: Prentice-Hall.	☐
Further	Valentice, D.T., & Hahn. B.H. (2022) <i>Essential MATLAB for Engineers and Scientists</i> . Cambridge, Massachusetts. Academic Press.	☐
Further	MATLAB Fundamentals MATLAB Fundamentals Self-Paced Online Courses - MATLAB & Simulink (mathworks.com)	☒

Module Code	ACHA5034
Title	Project Management
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide students with knowledge and understanding of engineering project planning, potential risk identification and project monitoring, together with workforce motivation and teamwork.

LEARNING OUTCOMES

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

- analyse and plan an engineering project by evaluating interdependencies between tasks, and apply appropriate tools to monitor and control project progress;
- critically evaluate individual motivational behaviours and team dynamics, assessing the impact of different leadership approaches on workforce performance and collaboration.

INDICATIVE CONTENT

- Effective & Efficient Working:
 - Time Management.
 - Motivation techniques and models.
- Management:
 - Management and group behaviour.
 - Management and leadership styles.
 - Leadership power.
 - Change management.
- Regulation and legislation:
 - Product liability.
 - Types of contracts.
 - Contractual obligations and variations.
- Project Management:
 - Product development models.
 - Project planning techniques.
 - Identifying project risks, risk management.
 - Project monitoring.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	2500 words	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **assessed** in this module:

C15: Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights.

C16: Function effectively as an individual, and as a member or leader of a team.

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C5: Design solutions for complex problems that meet a combination of societal, user, business, and customer needs.

C6: Apply an integrated or systems approach to the solution of complex problems.

C8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.

C9: Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity.

C14: Discuss the role of quality management systems and continuous improvement in the context of complex problems.

INDICATIVE READING LIST

Module Code	ACHA5034	
Module Title	Project Management	
Classification	Reading List entry	Electronic*
Essential	Maylor, H. and Turner, N. (2022) <i>Project management</i> . Fifth edition. Harlow: Pearson.	☒
Essential	Smith, N.J. (ed.) (2007) <i>Engineering project management</i> . Third edition. Oxford: Blackwell.	☐
Essential	Mullins, L.J. and Rees, G. (2023) <i>Management and organisational behaviour</i> . Thirteenth edition. Harlow, United Kingdom: Pearson Education.	☐
Further	General Management www.mindtools.com	☒
Further	Sustainable Business http://www.edie.net/index.asp	☒
Further	Ruskin, A. & Estes, W. (1994) <i>What every Engineer Should Know About Project Management</i> Boca Raton. CRC Press	☐
Further	Nicholas, J.M & Steyn, H (2020) <i>Project Management for Engineering, Business and Technology</i> Oxfordshire, Routledge	☐

Module Code	ACHA5035
Title	Stress Analysis
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide students with a comprehensive understanding of stress analysis in engineering materials and structures, emphasizing the practical application of theory in real-world scenarios. The module will cover the fundamental concepts of stress, strain, and material properties, along with advanced analytical and numerical methods for solving complex engineering stress analysis problems.

LEARNING OUTCOMES

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

- utilise fundamental principles of mechanics, material science, and mathematics to understand and analyse: stress, strain, and failure mechanisms in engineering components and structures;
- identify complex stress-related problems, apply first principles of engineering for analysis, and use analytical methods to develop viable solutions.

INDICATIVE CONTENT

- Stress and Strain:
 - Stress and strain of linear elastic materials.
 - Poisson's Ratio.
 - 2D combined stress and strain.
 - Bulk Modulus and Volumetric Strain.
- Complex stress:
 - Principal Stresses and Principle Planes.
 - Construction and interpretation of Mohr's circle.
 - Combined Loading (Torsion, Bending and Axial).
- Beam Bending:
 - Simple Bending Equation, Shear Force and Bending Moment Diagrams.
 - Deflection of beams using standard cases and the principle of superposition.
 - Deflection of beams using the double integration method.
- Pressure Vessels:
 - Thin walled pressure vessels.
 - Thick walled pressure vessels using Lamé's equations.
- Failure:
 - Elastic failure.
 - Buckling failure; Eulers theory.
 - Fatigue failure and preventative measures.

- Failure theories/criteria.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

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

Mode of assessment	Volume	Weighting
Exam	2 Hours	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C9: Use a risk management process to identify, evaluate, and mitigate risks associated with a particular project or activity.

C13: Select and apply appropriate materials, equipment, engineering technologies, and processes, recognising their limitations.

INDICATIVE READING LIST

Module Code	ACHA5035	
Module Title	Stress Analysis	
Classification	Reading List entry	Electronic*
Essential	Dowling, N.E., Kampe, S.L. and Kral, M.V. (2020) <i>Mechanical behavior of materials : engineering methods for deformation, fracture, and fatigue</i> . Fifth edition, global edition. Harlow: Pearson Education Limited.	☐

Essential	Budynas, R.G., Nisbett, J.K. and Shigley, J.E. (2015) <i>Shigley's mechanical engineering design</i> . Tenth edition. New York, NY: McGraw-Hill Education.	☐
Essential	Bird, J. O., & Ross, C. T. F. (2020). <i>Mechanical engineering principles</i> Fourth edition. Oxford. Routledge.	☐
Further	Hearn, E.J. (1997) <i>An introduction to the mechanics of elastic and plastic deformation of solids and structural materials</i> . 3rd ed. Oxford ; Butterworth-Heinemann.	☐
Further	Hearn, E.J. (1997) <i>The mechanics of elastic and plastic deformation of solids and structural materials</i> . 3rd ed. Oxford ; Butterworth-Heinemann.	☐
Further	Mac Donald, B.J. (2020) <i>Practical stress analysis with finite elements</i> . Third edition. Dublin, Ireland: Machdohnil Ltd.	☐
Further	Science Direct (https://www.sciencedirect.com/)	☒

Module Code	ACHA5036
Title	Thermodynamics
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide an in-depth understanding of thermodynamics and its applications in automotive engineering. It focuses on thermodynamic processes, energy conversion, and efficiency to equip students with the skills necessary for analysing, simulating, and optimising engine performance.

LEARNING OUTCOMES

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

- apply thermodynamic principles to evaluate energy conversion and efficiency in internal combustion engines and other automotive systems;
- analyse real-world engine performance data using thermodynamic models to optimise system behaviour and support engineering decisions.

INDICATIVE CONTENT

- Engine Cycles: Theoretical analysis of Otto, Diesel, Carnot and Brayton cycles, including impacts on efficiency.
- Heat Release during Combustion: Mechanisms of heat release, effects of combustion characteristics on performance & efficiency.
- First Law of Thermodynamics: Principles of energy conservation, application to automotive systems.
- Second Law of Thermodynamics: Analysis of cycle efficiencies, system performance under various conditions.
- Heat Transfer Modes: Study of conduction, convection, radiation, and their relevance in automotive engineering.
- Engine Performance Simulation: Use of simulation tools to model engine characteristics, optimise output and emissions.
- Real Engine Cycles: Understanding the differences between real and theoretical engine cycles and the use of real data for analysing engine performance characteristics.
- Cylinder Pressure Analysis: Techniques for measuring and analysing cylinder pressure to improve combustion performance and reduce emissions.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Workbook	2500 words	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C3: Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed.

C12: Use practical, laboratory, and workshop skills to investigate complex problems.

C13: Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations.

C17: Communicate effectively on complex engineering matters with technical and non-technical audiences.

INDICATIVE READING LIST

Module Code	ACHA5036	
Module Title	Thermodynamics	
Classification	Reading List entry	Electronic*
Essential	Heywood, J. (2018) <i>Internal combustion engine fundamentals</i> . 2nd edition. New York, N.Y: McGraw-Hill Education.	☒

Essential	Turns, S.R. and Pauley, L.L. (2020) <i>Thermodynamics : concepts and applications</i> . Second edition Cambridge: Cambridge University Press.	☐
Further	Robert Bosch GmbH. (2022) <i>Automotive handbook</i> . 11th edition. Postfach, Karlsruhe: Robert Bosch GmbH.	☒
Further	Magrab, E.B. <i>et al.</i> (2000) <i>An engineer's guide to MATLAB</i> . Upper Saddle River, N.J: Prentice-Hall.	☐
Further	Valentice, D.T., & Hahn. B.H. (2022) <i>Essential MATLAB for Engineers and Scientists</i> . Cambridge, Massachusetts. Academic Press.	☐
Further	MATLAB Fundamentals MATLAB Fundamentals Self-Paced Online Courses - MATLAB & Simulink (mathworks.com)	☒

Module Code	ACHA5037
Title	Vehicle Aerodynamics
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To introduce students to the fundamental principles and applications of aerodynamics as they relate to ground vehicles. This module explores the aerodynamic forces and phenomena affecting vehicles in motion on roads, offering insights into the design, performance, and efficiency of road vehicles, motorcycles and motorsport applications.

LEARNING OUTCOMES

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

- demonstrate an understanding of the principles of aerodynamics and their relevance to ground vehicles, including the concepts of lift, drag, and flow separation;
- evaluate the impact of aerodynamic design decisions on aerodynamic performance.

INDICATIVE CONTENT

- Fluid Mechanics Fundamentals
 - Introduction to fluid mechanics principles concepts such as viscosity, turbulence, and boundary layers.
 - Analysis of fluid flow around stationary and moving objects.
 - Application of Bernoulli's equation and conservation laws to aerodynamic phenomena.
 - Calculation of aerodynamic forces using principles of fluid mechanics.
- Aerodynamic Forces and Moments
 - Examination of aerodynamic forces acting on ground vehicles.
 - Analysis of lift, drag, and side force components and their influence on vehicle dynamics.
 - Understanding the moments generated by aerodynamic forces and their impact on vehicle stability.
 - Discussion of factors affecting aerodynamic force distribution, such as vehicle shape and surface features.
- Vehicle Shapes and Aerodynamic Devices
 - General vehicle shapes and aerodynamic performance.
 - Aerodynamic features incorporated into vehicle design, such as body contours, spoilers, and diffusers.
 - Analysis of the role of aerodynamic devices in reducing drag, and/or enhancing downforce and stability
- Experimental testing of Vehicle Aerodynamics
 - Overview of experimental methods used to assess vehicle aerodynamics.

- Track testing methods to evaluate aerodynamic performance.
- Introduction to wind tunnel design features and testing techniques
- Case studies demonstrating the use of experimental testing to optimise vehicle aerodynamics and performance.
- Computational Fluid Dynamics Approaches
 - Introduction to computational fluid dynamics (CFD) and its role in vehicle aerodynamics analysis.
 - Overview of the CFD process
 - Discussion of the relative advantages and disadvantages of CFD as an aerodynamic assessment tool.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

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

Mode of assessment	Volume	Weighting
Exam	2 Hours	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C4 - Select and evaluate technical literature and other sources of information to address complex problems.

C6: Apply an integrated or systems approach to the solution of complex problems.

C12: Use practical laboratory and workshop skills to investigate complex problems.

INDICATIVE READING LIST

Module Code	ACHA5037	
Module Title	Vehicle Aerodynamics	
Classification	Reading List entry	Electronic*
Essential	Schüetz, T. (2016) <i>Aerodynamics of road vehicles</i> . Fifth edition. Warrendale: SAE International.	☒
Further	McBeath, S. (2017) <i>Competition car aerodynamics</i> . 3rd edition. Dorchester: Veloce.	☒
Further	Katz, J. (1995) <i>Race car aerodynamics : designing for speed</i> . Cambridge, Mass: Robert Bentley.	☐
Further	Barnard, R.H. (2009) <i>Road vehicle aerodynamic design : an introduction</i> . 3rd ed. St Albans: MechAero.	☐
Further	Segers, J. (2014) <i>Analysis techniques for racecar data acquisition</i> . Second Edition. Warrendale, Pa: SAE International.	☒
Further	Jacobson, B.J.H. (2020) <i>Vehicle Dynamics Compendium</i>	☒
Further	<i>Bernoulli aerodynamics international</i> . (2006). London: Racecar Graphic.	☐

Module Code	ACHA5038
Title	Vehicle Control Systems
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To develop student's knowledge and understanding of control systems within the context of automotive engineering, evaluating the application and integration of control theories and technologies to improve system performance and reliability.

LEARNING OUTCOMES

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

- apply established mathematical and engineering principles to analyse and model vehicle control systems, demonstrating an understanding of how these principles underpin real-world applications in automotive engineering;
- critically evaluate the suitability of various control strategies and computational techniques for solving complex dynamic vehicle problems, recognising the limitations of these methods and justifying the selection made;
- design and propose integrated vehicle control solutions that address safety, performance, environmental, and user-centred considerations, taking account of current industry standards and societal needs.

INDICATIVE CONTENT

- Conventional control theory: Laplace transforms, transfer functions, stability analysis, and controller design.
- Contemporary control methods: state-space models, observability, controllability, and digital control techniques.
- Introduction to control algorithms: PID, feedback and feedforward control, model predictive control, adaptive control, Fuzzy logic methods.
- Time domain analysis - root locus, Routh stability, transient performance.
- Frequency domain analysis - Nyquist diagrams, Nichol's chart, Bode diagrams, frequency testing.
- Control system applications in automotive engineering include engine control, ABS, and autonomous driving.
- Simulation tools for modelling and optimisation: MATLAB and Simulink applications.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 Hours	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C3: Select and apply appropriate computational and analytical techniques to model complex problems.

C5: Design solutions for complex problems that meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health and safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards.

C6: Apply an integrated or systems approach to the solution of complex problems.

INDICATIVE READING LIST

Module Code	ACHA5038	
Module Title	Vehicle Control Systems	
Classification	Reading List entry	Electronic*
Essential	Nise, N.S. (2019) <i>Control systems engineering</i> . Eighth edition. Hoboken, NJ: Wiley.	☐

Essential	Dorf, R.C. and Bishop, R.H. (2022) <i>Modern control systems</i> . Fourteenth edition, Global edition. Harlow: Pearson Education Limited.	☐
Further	Hughes, A. and Drury, B. (2019) <i>Electric motors and drives: fundamentals, types and applications</i> . Fifth edition. Oxford, United Kingdom: Newnes, an imprint of Elsevier.	☒
Further	Ehsani, M. et al. (2019) <i>Modern electric, hybrid electric, and fuel cell vehicles</i> . Third edition, International student edition. Boca Raton: CRC Press, an imprint of Taylor & Francis Group.	☒
Further	Rahn, C.D. and Wang, C.-Y. (2013) <i>Battery systems engineering</i> . Chichester: Wiley.	☒
Further	https://batteryuniversity.com/	☒
Further	Electric and Hybrid Vehicle Technology International. (UKIP Media and Events Ltd). https://www.electrichybridvehicletechnology.com/	☒

Module Code	ACHA5039
Title	Vehicle Development
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To develop students' knowledge and critical understanding of the complete vehicle development process using the V-model. This includes identifying and translating customer requirements into engineering specifications, employing appropriate design and development strategies, integrating systems effectively, and ensuring robust testing, sign-off, and production release practices.

LEARNING OUTCOMES

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

- demonstrate a critical understanding of the complete vehicle development V-model by analysing how customer requirements are captured, translated into functional specifications, and managed throughout design, integration, and validation stages;
- evaluate the requirements for system function compliance and component-level verification, with consideration given to efficiency and relevant legislative requirements.

INDICATIVE CONTENT

- Establishing Customer Requirements: Identification of customer requirements, and targets. Understanding market trends and competitive benchmarking.
- System Level Specifications: Identify vehicle level functional specification and associated sub-system technical specification.
- Identifying Critical Functions: Applying Total Quality Systems approaches. Use of Failure Mode and Effects Analysis (FMEA) and Design for Six Sigma (DFSS).
- Components Level Compliance: Generate component level specification for both hardware and software elements.
- System Test and Validation: Fundamentals of system integration and test processes to ensure fitness for purpose and compliance to customer requirements. Hardware-in-the-Loop (HiL) and Software-in-the-Loop (SiL) testing methods.
- Engineering release and acceptance: Ensuring the product(s) are fit for purpose and comply with all relevant legislative requirements. Sign-off process for vehicle manufacturing, including quality gates and the application of quality management systems (ISO 9001, IATF 16949, Lean 6 σ concepts).

- Warranty and concern reporting and corrective action: Identifying post product supply issues and assessing suitable systems to mitigate the effect(s) of failure. Implementation of root cause analysis and continuous improvement strategies.
- Sustainability Considerations: Environmental Impact planning from Product conception through to End-of Life, including Lifecycle assessment and circular economy principles.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	2500 words	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study. C6: Apply an integrated or systems approach to the solution of complex problems.

C3: Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed.

C5: Design solutions for complex problems that meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health & safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards.

C6: Apply an integrated or systems approach to the solution of complex problems.

C9: Use a risk management process to identify, evaluate, and mitigate risks associated with a particular project or activity.

C10: Adopt a holistic and proportionate approach to the mitigation of security risks.

C14: Discuss the role of quality management systems and continuous improvement in the context of complex problems.

C15: Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights.

INDICATIVE READING LIST

Module Code	ACHA5039	
Module Title	Vehicle Development	
Classification	Reading List entry	Electronic*
Essential	Weber, J., (2009) <i>Automotive Development Processes</i> . New York. Springer	☐
Essential	Bhise, V., (2017) <i>Automotive Product Development</i> . Boca Raton. CRC Press.	☐
Further	Robert Bosch GmbH. (2022) <i>Automotive handbook</i> . 11th edition. Postfach, Karlsruhe: Robert Bosch GmbH.	☒
Further	Hoyle, D., (2005) <i>Automotive Quality Systems Handbook</i> , Second Edition. Oxford. Butterworth-Heinemann	☐
Further	Staron, M.(2021) <i>Automotive Software Architectures: AN Introduction</i> . Second Edition. New York. Springer	☒
Further	Pyzdek, T. and Keller, P.A. (2019) <i>The six sigma handbook</i> . Fifth edition. New York: McGraw-Hill Education.	☒
Further	Bicheno, J. and Holweg, M. (2023) <i>The lean toolbox : a sourcebook for process improvement</i> . Sixth edition. Buckingham: PIC	☒
Further	SAE International, <i>Automotive Engineering Periodical</i>	☒
Essential	Weber, J., (2009) <i>Automotive Development Processes</i> . New York. Springer	☐
Essential	Bhise, V., (2017) <i>Automotive Product Development</i> . Boca Raton. CRC Press.	☐

Module Code	ACHA5040
Title	Vehicle Driveline Performance
Date	29/07/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide students with an understanding of vehicle transmission systems together with the application of alternative friction devices for torque control.

LEARNING OUTCOMES

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

- demonstrate knowledge and understanding of different transmission systems and their application;
- demonstrate subject specific skills and cognitive skills in the application of friction elements for torque regulation and control.

INDICATIVE CONTENT

- Rotating Elements:
 - Rotational inertia.
 - Rotational Kinetic Energy.
 - Rolling elements.
- Braking systems:
 - Kinetic Energy
 - Vehicle longitudinal weight transfer.
 - Mechanical/hydraulic advantage.
 - Force amplification systems.
 - Friction element behaviour.
- Clutch Systems:
 - Constant pressure and constant wear approaches.
 - Flat plate and multiplate devices.
 - Cone clutches.
- Transmission Systems:
 - Gear teeth forms and production.
 - Simple and compound gear trains.
 - Epicyclic gear systems.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.

C6: Apply an integrated or systems approach to the solution of complex problems.

C13: Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations.

INDICATIVE READING LIST

Module Code	ACHA5040	
Module Title	Vehicle Driveline Performance	
Classification	Reading List entry	Electronic*
Essential	Zhang, Y. and Mi, C. (2018) <i>Automotive power transmission systems</i> . Hoboken, NJ: John Wiley & Sons Ltd.	☒
Essential	Budynas, R.G., Nisbett, J.K. and Shigley, J.E. (2015) <i>Shigley's mechanical engineering design</i> . Tenth edition. New York, NY: McGraw-Hill Education.	☐
Essential	Day, A. and Bryant, D. (2022) <i>Braking of road vehicles</i> . Second edition. Amsterdam: Butterworth-Heinemann.	☒

Further	Heisler, H. and Society of Automotive Engineers (2002) <i>Advanced vehicle technology</i> . 2nd ed. Amsterdam, Netherlands: Elsevier.	☒
Further	Robert Bosch GmbH. (2022) <i>Automotive handbook</i> . 11th edition. Postfach, Karlsruhe: Robert Bosch GmbH.	☒

Module Code	ACMA5000
Title	Group Industrial Project
Date	01/02/2021
Level	5
Credits	40
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
D6	Communicate their work to technical and non-technical audiences
EL1	Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct
EL3b	Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering objectives
P1	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc)
P4	Understanding of the use of technical literature and other information sources
P11b	Understanding of, and the ability to work in, different roles within an engineering team
G1	Apply their skills in problem solving, communication, information retrieval, working with others and the effective use of general IT facilities
G2	Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
G3b	Plan and carry out a personal programme of work, adjusting where appropriate
G4	Exercise initiative and personal responsibility, which may be as a team member or leader

AIM(S)

- Provide students with the skills to undertake an industry-based project and demonstrate the application of project management techniques through a range of tools and techniques applied to the chosen industrial project.

LEARNING OUTCOMES

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

- Demonstrate specific skills with respect to planning and executing an industry based project with respects to costing, budget controls, time management, team working, health and safety and environmental considerations
- Explain technical and business concerns related to the project, evaluate problems fully, demonstrate presentation and communication skills

INDICATIVE CONTENT

- Project planning and development of project plan, apply risk based techniques to projects
- Problem solving methodologies and application of tools and techniques used in problem solving
- Team working skills and group dynamics
- Cost analysis and budget preparation

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	36	9%
Independent learning	304	76%
Placement learning	60	15%
TOTAL	400	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Industrial Progress Presentation	15 minutes	25%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Interim Progress Report	2,500 words	20%

Assessment Component 3

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Work-based report	2,500 words	30%

Assessment Component 4

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Presentation	15 minutes	25%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5000	
Module Title	Group Industrial Project	
Classification	Reading List entry	Electronic*
Essential	Maylor, H (2010) Project Management, 4 th Edition	☐
Essential	Grit, R (2019) Project Management: A Practical Approach 5 th Edition, Noordhoff	☐
Essential	Mullins, L (2016) Management and Organisational Behaviour, 11 th Edition, Pearson	☐
Further	Leong, M (2019) The Principle of Effective Project Management: The Proven System, Independently Published	☐
Further	Cluster, K (2019) Agile Project Management, Independently Published	☐
Further	Bonnema, G Veenvliet, K and Broenink, J (2015) System Design and Engineering: Facilitating Multidisciplinary Development Project, CRC Press	☐
Further	Seppala, N (2010) Business Ethics and Corporate Social Responsibility, Cengage Learning	☐
Further	Journal of Production Economics	☒
Further	Journal of Systems and Software	☒
Further	International Journal of Project Management	☒
Further	Computers & Education	☒
Further	Procedia Manufacturing	☒
Further	Computers in Industry	☒
Further	Learning and Individual Differences	☒
Further	Journal of Engineering and Technology Management	☒
Further	Industrial Marketing Management	☒
Further	Journal of Cleaner Production	☒
Further	www.teamgantt.com	☒
Further	www.mindtools.com	☒
Further	www.managers.org.uk	☒
Further	www.institutelm.com	☒
Further	www.i-l-m.com	☒
Further	www.imeche.org	☒
Further	www.apm.org.uk	☒
Further	www.pmi.org	☒

Module Code	ACMA5001
Title	Control and Automation
Date	12/07/2024
Level	5
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
SM1b	Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies
EA4b	Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems
P1	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc)
P8	Ability to work with technical uncertainty

AIM(S)

- To enable students to understand the principles of instrumentation and control and pneumatics and hydraulics, and analyse control strategies as applied to process control and industrial automation.

LEARNING OUTCOMES

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

- Demonstrate an understanding of the fundamental concepts in thermodynamics and fluid systems and solve engineering problems.
- Demonstrate an understanding of industrial sensors used in process control, the fundamentals of pneumatic and hydraulic control systems, and the ability to evaluate automatic control strategies, and design of control systems.

INDICATIVE CONTENT

- System elements – classification of transducers, sensors and actuators (also applied to pneumatics and hydraulics). Development of a system block diagram, block diagram reduction.
- System modelling and analysis – physical laws governing behaviour of systems. Lumped-parameter models, differential equations used to model dynamic behaviour. System analysis and response to test inputs. Performance specifications for second order systems.
- Fundamentals of transfer functions – s-plane analysis. Simple transfer function analysis. Transient response to 1st & 2nd order systems from transfer functions. Feedback and closed-loop systems and transfer functions. Proportional, integral and differential (PID) control. Introduction to system stability and stability criteria.
- Pneumatic and hydraulic power and control systems – design and analysis of simple power transmission systems utilising air and fluid power, and the control of these systems.
- Current technologies – overview of: PLCs, digital control, intelligent systems, distributed measurement and/or control systems.

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
Coursework	2500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, EA4b, P1, P8

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, P1

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5001	
Module Title	Control and Automation	
Classification	Reading List entry	Electronic*
Essential	Nise, N.S. Control Systems Engineering, 8 th Edition (John Wiley & Sons, 2019)	☐
Essential	Dorf, R.C., Bishop, R.H., Modern Control Systems, 13 th Edition (Pearson, 2017)	☐
Essential	DiStefano, J.J., Stubbleud A.R., Williams, I.J., Schaum's Outline of Feedback and Control Systems, 3 rd Edition. (McGraw-Hill Education, 2013)	☐
Further	IEEE Control Systems (IEEE Control Systems Society)	☒
Further	Control Systems Magazine (IEEE Control Systems Society)	☒

Module Code	ACMA5007
Title	Management, Innovation and Sustainability
Date	12/07/2024
Level	5
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
EL1	Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct
EL2	Knowledge and understanding of the commercial, economic and social context of engineering processes
EL3b	Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering objectives
EL4	Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate
EL5	Awareness of the relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues
EL6	Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques
P5	Knowledge of relevant legal and contractual issues
P6	Understanding of appropriate codes of practice and industry standards
P7	Awareness of quality issues and their application to continuous improvement
P11b	Understanding of, and the ability to work in, different roles within an engineering team

AIM(S)

- To instruct students to the social and commercial context of the engineering industry in terms of business environments including: management organisation and project management, financial management and marketing.

LEARNING OUTCOMES

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

- Show detailed knowledge and understanding of the relationship between an engineering organisation and the industrial, socio-economic and environmental context in which it is found.
- Demonstrate subject specific skills and cognitive skills in recognising and evaluating accounting methods, planning, costing and monitoring projects, workforce motivation and team dynamics.

INDICATIVE CONTENT

- Business organisations and the environment: types of business organisations; analysis of the organisation and its external environment; the engineering industry in the UK and global economy.
- Regulation and Legislation: product liability and contractual obligations, data protection legislation, protection of intellectual property.
- Business ethics: Corporate social responsibility, the engineer's responsibility to society.
- Management and Group Behaviour: management and leadership styles; management roles; management decision making and problem solving; management of change; motivation; quality management; group behaviour and dynamics; individual behaviour; personality and perception.
- Financial and Management Accounting: financial statements; cash flow; capital expenditure and revenue; cost behaviour; budgets.
- Marketing: the marketing mix; sponsorship funding models, pricing of goods and services.

- Project management: Project planning techniques, project monitoring, managing risk.

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
Assignment	2500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:

EL1, EL2, EL3b, EI4, EL5, EL6, P5, P6, P7, P11b

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:

EL1, EL2, EL3b, EI4, EL5, EL6, P5, P6, P7

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5007	
Module Title	Management, Innovation and Sustainability	
Classification	Reading List entry	Electronic*
Essential	Krietner, R., Principles of Management 12th Edition (South Western College, Jan 2012)	☐
Essential	Maylor, H., Project Management 4th Edition (FT Prentice Hall, 2010)	☒

Essential	Mullins L.J, H., Management and Organisational Behaviour (Pearson Education, 2016)	☒
Further	Bowen, R., Engineering Ethics (Springer, 2016)	☒
Further	Masterman, G., Sponsorship – for a Return on Investment Butterworth (Heinemann, 2007)	☒
Further	Kotler, P., Principles of Marketing 18th Edition (Pearson, 2020)	☒
Further	Dyson, J., Accounting for Non-Accounting Students 10th Edition (Pearson, 2020)	☐
Further	General Management www.mindtools.com	☐
Further	Sustainable Business http://www.edie.net/index.asp	☒

Module Code	ACMA5008
Title	Thermofluids and Control
Date	12/07/2024
Level	5
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
SM1b	Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies
EA1b	Understanding of engineering principles and the ability to apply them to analyse key engineering processes
P1	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc)

AIM(S)

- To cover an extended range of principles which underpin the design and operation of thermodynamic and fluid systems.
- To enable students to understand the principles of instrumentation and control and pneumatics and hydraulics, and analyse control strategies as applied to process control and industrial automation.

LEARNING OUTCOMES

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

- Demonstrate an understanding of the fundamental concepts in thermodynamics and fluid systems and solve engineering problems.
- Demonstrate an understanding of industrial sensors used in process control, the fundamentals of pneumatic and hydraulic control systems, and the ability to evaluate automatic control strategies, and design of control systems.

INDICATIVE CONTENT

- Introduction to the forms of energy, particularly Heat and Work and why these are different.
- Thermodynamics processes.
- Application of the first law to thermodynamics systems.
- Ideal Gases - Non flow, steady flow and unsteady-flow processes with ideal gases - use of the gas laws.
- Fluid Statics - properties of fluids, measurement of pressure, types of pressure and their relationship.
- Fluid flow – use of Bernoulli equation, measurement of flow rate and use of the continuity equation.
- Fluid flow – introduction to laminar, turbulent flow and dimensionless theory.
- Modes of heat transfer: conduction, convection and radiation
- System elements – classification of transducers, sensors and actuators (also applied to pneumatics and hydraulics). Development of a system block diagram, block diagram reduction.

- System modelling and analysis – physical laws governing behaviour of systems. Lumped-parameter models, differential equations used to model dynamic behaviour. System analysis and response to test inputs. Performance specifications for second order systems.
- Fundamentals of transfer functions – s-plane analysis. Simple transfer function analysis. Transient response to 1st & 2nd order systems from transfer functions. Feedback and closed-loop systems and transfer functions. Proportional, integral and differential (PID) control. Introduction to system stability and stability criteria.
- Pneumatic and hydraulic power and control systems – design and analysis of simple power transmission systems utilising air and fluid power, and the control of these systems.
- Current technologies – overview of: PLCs, digital control, intelligent systems, distributed measurement and/or control systems.

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%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, P1

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, EA1b, P1

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5008	
Module Title	Thermofluids and Control	
Classification	Reading List entry	Electronic*
Essential	Cengel, Y., Boles, M., Thermodynamics: An Engineering Approach, 9 th Edition (McGraw-Hill Education, 2018)	☐
Essential	Nise, N.S. Control Systems Engineering, 8 th Edition (John Wiley & Sons, 2019)	☐
Essential	Dorf, R.C., Bishop, R.H., Modern Control Systems, 13 th Edition (Pearson, 2017)	☐
Essential	DiStefano, J.J., Stubberud A.R., Williams, I.J., Schaum's Outline of Feedback and Control Systems, 3 rd Edition. (McGraw-Hill Education, 2013)	☐
Further	Weigand, B., Analytical Methods for Heat Transfer and Fluid Flow Problems, 2 nd Edition (Springer, 2015)	☐
Further	Baskharone, E. A., Thermal Science (McGraw Hill, 2012)	☐
Further	Douglas, J.F., Gasiorek, J., Swaffield, J., Fluid Mechanics, 6 th Edition (Prentice Hall, 2011)	
Further	Krieth, F. and Bohn, M. S., Principles of Heat Transfer (Brooks/Cole, 2001)	☐

Module Code	ACMA5011
Title	Thermofluid Mechanics
Date	12/07/2024
Level	5
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
SM1b	Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies
EA1b	Understanding of engineering principles and the ability to apply them to analyse key engineering processes
P1	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc)

AIM(S)

- To introduce the student to the theories behind the established design, performance and analysis of a range of thermofluid applications encountered in engineering

LEARNING OUTCOMES

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

- demonstrate and understanding of the fundamental concepts in thermodynamics and fluid systems and solve problems in thermofluid mechanics and the integration of the principles of heat transfer and fluid flow with thermodynamic theory / applications and the modelling of such problems
- show transferable skills in the use of theoretical and practical methods in problem-solving, decision-making and the interpretation of experimental results

INDICATIVE CONTENT

- The First Law of Thermodynamics and the non-flow energy equation and steady flow energy equation
- The Second Law of Thermodynamics and Cyclic systems. Carnot Efficiency, irreversibility and entropy
- Cyclic systems and power generation - gas and steam power plants (based on Joule and Rankine cycles) - cycle efficiencies. Otto, Diesel and Dual (mixed) cycles. Principles and applications of common thermodynamic cycles
- Refrigeration and heat pumps (outlined)
- Modes of heat transfer: conduction (Fourier's Law); convection – fluid flow, properties and geometric factors. Radiation (Steffan/Boltzmann Equation)
- Characteristics of fluid flow: Viscous flow in pipes - evaluation of friction factors and head losses. Pumping power requirements.
- Fundamentals of heat exchanger design and applications in industry.

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%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, EA1b, P1

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Assessment of practical work	2,500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, EA1b, P1

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5011	
Module Title	Thermofluid Mechanics	
Classification	Reading List entry	Electronic*
Essential	Cengel, Y., Boles, M., Thermodynamics: An Engineering Approach, 9 th Edition (McGraw-Hill Education, 2018)	☐
Essential	Nise, N.S. Control Systems Engineering, 8 th Edition (John Wiley & Sons, 2019)	☐
Essential	Dorf, R.C., Bishop, R.H., Modern Control Systems, 13 th Edition (Pearson, 2017)	☐
Essential	DiStefano, J.J., Stubberud A.R., Williams, I.J., Schaum's Outline of Feedback and Control Systems, 3 rd Edition. (McGraw-Hill Education, 2013)	☐
Further	Weigand, B., Analytical Methods for Heat Transfer and Fluid Flow Problems, 2 nd Edition (Springer, 2015)	☐
Further	Baskharone, E. A., Thermal Science (McGraw Hill, 2012)	☐
Further	Douglas, J.F., Gasiorek, J., Swaffield, J., Fluid Mechanics, 6 th Edition (Prentice Hall, 2011)	
Further	Spakovszky, Z.S., Thermodynamics & Propulsion, MIT Course 2008-2009, viewed 2019 http://web.mit.edu/16.unified/www/FALL/thermodynamics/	☒
Further	Krieth, F. and Bohn, M. S., Principles of Heat Transfer (Brooks/Cole, 2001)	☐
Further	Rogers, G., Mayhew, Y., Engineering Thermodynamics: Work and Heat Transfer, 4 th Edition (Longman Scientific, 1992)	☐

Module Code	ACMA5013
Title	Capacity Planning
Date	07/08/2023
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To analyse and apply forecasting and planning techniques.

LEARNING OUTCOMES

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

- apply a range of forecasting and planning techniques required in logistics and supply chain management.

INDICATIVE CONTENT

- Identification and analysing different demand trends.
- The role of forecasting in a supply chain.
- Demand Planning and Forecasting.
- Capacity Planning and Forecasting.
- Exponential Smoothing and Trend Analysis.
- Time series forecasting.
- Advanced forecasting techniques.
- Addressing Bullwhip effect.
- Capacity Management strategies.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exercise on forecasting demand planning presented in an essay	2,000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5013	
Module Title	Capacity Planning	
Classification	Reading List entry	Electronic*
Essential	Rushton, A. et al, (2017) <i>The Handbook of Logistics and Distribution Management: Understanding the Supply Chain</i> 5 th Ed, London: Kogan Page	☐
Essential	Crandall, W., Chen, C. C. and Crandall, R. (2015) <i>Principles of Supply Chain Management</i> 2 nd Ed, London: CRC Press	☐
Essential	Russell, R. S. and Taylor, B. W. (2019) <i>Operations and Supply Chain Management</i> , 10th Ed, Chichester: Wiley	☒
Further	Mangan, J. (2016). <i>Global Logistics and Supply Chain Management</i> 2 nd Ed, Chichester: Wiley	☐
Further	Chopra, S. (2019) <i>Supply Chain Management Strategy, Planning and Operations</i> London: Pearson	☐

Module Code	ACMA5014
Title	Data Analysis
Date	07/08/2023
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To explore and apply data science, AI and Machine learning for intelligent logistics systems.

LEARNING OUTCOMES

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

- apply knowledge of the data science, AI and machine learning disciplines, and develop skills of using AI systems and data analytics.

INDICATIVE CONTENT

- Data Analysis and Data Science.
- Data Analytics.
- Statistical Analysis.
- Data Visualisation.
- Decision Making.
- Data-driven Logistics and Supply Chains.
- Big data in logistics and Supply Chain Management.
- Application of Big Data and Predictive Analytics.
- AI and Machine learning.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Video Presentation	20 minutes	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5014	
Module Title	Data Analysis	
Classification	Reading List entry	Electronic*
Essential	Liu, K. Y. (2022) <i>Supply Chain Analytics: Concepts, Techniques and Applications</i> Basingstoke: Palgrave Macmillan Cham. ISBN 9783030922238 (doi: 10.1007/978-3-030-92224-5)	☐
Essential	Tipi, N. (2021) <i>Supply Chain Analytics and Modelling: Quantitative Tools and Applications</i> , London: Kogan Page	☐
Essential	Marr, B. (2015) <i>Big Data: Using SMART Big Data, Analytics And Metrics To Make Better Decisions And Improve Performance</i> Chichester: John Wiley & Sons	☐
Essential	Laha, D. and Mandal, P. (2007) <i>Handbook of Computational Intelligence in Manufacturing and Production Management</i> Calgary: Idea Group Inc	☒
Further	Bag, D. (2016) <i>Business Analytics</i> 1 st Ed, Abingdon: Taylor & Francis	☐
Further	Gupta, D. (2018) <i>Applied Analytics Through Case Studies using SAS and R: Implementing Predictive Models and Machine Learning Techniques</i> Berkeley CA: Apress doi:10.1007/978-1-4842-3525-6	☐
Further	Loth, A. (2019) <i>Visual Analytics with Tableau</i> Chichester: Wiley	☐
Further	Witten, I. H., Elbe, F., Hall, M. A., and Pal, C. J. (2016) <i>Data Mining: Practical Machine Learning Tools and Techniques</i> Cambridge MA: Morgan Kaufmann	☐
Further	Choi, T. M., Wallace, S. W. and Wang, Y. (2017) <i>Big Data Analytics in Operations Management</i> Production and Operations Management doi: 10.1111/poms.12838.	☐

Module Code	ACMA5015
Title	Ethics and Law
Date	07/08/2023
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To analyse the general legislation, contract law, regulations and ethics required in logistics, transport and supply chain management.

LEARNING OUTCOMES

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

- analyse and interpret the legislation, contract laws and ethical requirements in a supply chain;
- develop skills for interpreting and applying the legislations and contract laws.

INDICATIVE CONTENT

- External environment
- Legal, regulatory, ethical and social requirements.
- Managing ethics and social responsibility.
- Ethics and decision-making.
- Contract Law.
- Types of contracts.
- Contracts and third parties.
- Contractual terms, illegality and liability.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	2,000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5015	
Module Title	Ethics and Law	
Classification	Reading List entry	Electronic*
Essential	Mellahi, K. and Wood, G. E. (2003) <i>The Ethical Business: Challenges and Controversies</i> Basingstoke: Palgrave	☐
Essential	Akkucuk, U. (2019) <i>Ethical and Sustainable Supply Chain Management in a Global Context</i> Hershey PA: IGI Global	☒
Essential	Finch, E. and Fafinski, S. (2015) <i>Contract Law</i> 4 th Ed, Harlow: Pearson	☒
Essential	Stone, R. (2013) <i>The Modern Law of Contract</i> 10 th Ed, London: Routledge	☐
Further	Gensler, H. J. (2017) <i>Ethics: A Contemporary Introduction (Routledge Contemporary Introductions to Philosophy)</i> 3 rd Ed, New York: Routledge.	☐
Further	Well-being of Future Generations (Wales) Act 2015 (Online). Available at http://www.legislation.gov.uk/anaw/2015/2/contents/enacted	☒

Module Code	ACMA5016
Title	Logistics Technologies
Date	07/08/2023
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To analyse a range of technologies used in logistics and supply chains, to improve performance while considering the emergence of digital technologies .

LEARNING OUTCOMES

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

- evaluate the benefits of the application of the emerging technologies for logistics and supply chains while considering the security of these systems;
- assess a range of technologies that can be used to reduce emissions and help meet Net Zero targets .

INDICATIVE CONTENT

- Background of Logistics 4.0 and further 5.0.
- Digitalisation of logistics and supply chains.
- The use of green technologies in vehicle fleets such as electrification and hydrogen while considering infrastructure issues.
- Transportation automation.
- Cybersecurity in logistics and supply chains.
- Routing and satellite tracking.
- Future of supply chains.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Digitalisation exercise	2,000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5016	
Module Title	Logistics Technologies	
Classification	Reading List entry	Electronic*
Essential	McKinnon, A. (2018) <i>Decarbonising Logistics: Distributing Goods in a Low Carbon World</i> , London, Kogan Page	☐
Essential	Aktas , E., Bourlakis , M., Minis , I. and Zeimpekis , V. (2021) <i>Supply Chain 4.0 - Improving Supply Chains with Analytics and Industry 4.0 Technologies</i> London: Kogan Page	☐
Essential	Evans, D., Evans, D., and Williamson, A. (2020) <i>The Road to Zero Emissions</i> , London, Kogan Page	☐
Further	Carnovale, S. and Yenyurt, S. (2021) <i>Cyber Security and Supply Chain Management</i> , Danvers: World Scientific	☐
Further	Modrak, V., Zsifkovitis, H and Matt, D (2020) <i>Industry 4.0 for SMEs: Challenges, Opportunities and Requirements</i> , Basingstoke, Palgrave Macmillan	☒
Further	Venkatram, A. and Sculte, N (2018) <i>Urban Transportation and Air Pollution</i> , Oxford Elsevier	☐

Module Code	ACMA5017
Title	Managing Change
Date	07/08/2023
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To evaluate and develop concepts and strategies for managing change.

LEARNING OUTCOMES

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

- develop knowledge and skills for organisational change and culture in a logistics company;
- critically evaluate strategies and practices for managing change.

INDICATIVE CONTENT

- Change Management Concepts.
- Planned change versus Emergent change.
- Theories and strategies for managing change.
- Leadership models and theories.
- Managing change in complex systems.
- Resistance and resilience.
- Culture and change management.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Case study exercise	2,000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5017	
Module Title	Managing Change	
Classification	Reading List entry	Electronic*
Essential	Cameron, E. and Green, M. (2019) <i>Making Sense of Change Management</i> 5 th Ed, London: Kogan Page	☐
Essential	Hayes, J. (2022) <i>The Theory and Practice of Change Management</i> 6 th Ed, London: Macmillan	☐
Essential	Burns, M (2017) <i>Managing Change</i> 7 th Ed, Harlow: Pearson	☐
Further	Project Management Institute (2013) <i>Managing Change in Organisations: A Practical Guide</i> Pennsylvania: Project Management Institute	☐
Further	Beech, N. and Macintosh, R. (2012) <i>Managing Change: Enquiry and Action</i> Cambridge: CUP	☐
Further	Smith, R., Kind, D., Sidhu, R. and Skelsey, D. (2014) <i>The Effective Change Manager's Handbook: Essential Guidance to the Change Management Body of Knowledge</i> London: Kogan Page	☐
Further	Franklin, M. (2021) <i>Agile Change Management: A Practical Framework for Successful Change Planning and Implementation</i> 2 nd Ed, London: Kogan Page	☐

Module Code	ACMA5018
Title	Modelling and Simulation
Date	07/08/2023
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To critically evaluate modelling and simulation techniques and solutions for logistics operations and supply chains.

LEARNING OUTCOMES

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

- understand the role which digital modelling and simulation has within a process improvement framework;
- evaluate modelling solutions (i.e. Value Stream Mapping) to improve the performance of a logistics system and to make recommendations for future development and implementation.

INDICATIVE CONTENT

- Logistics System Analysis and Simulation.
- Digital modelling and simulation overview. Different classification of modelling – off-line programming, discrete event simulation, virtual commissioning.
- Process Flow Mapping and Value Stream Mapping – extracting maximum benefit prior to development of digital models.
- Defining characteristics – digital models vs. digital shadows vs. digital twins.
- Understanding the desired simulation outputs and determining data collection requirements. Automated data logging and data collection technologies.
- Statistical analysis techniques for distribution.
- Practical modelling exercises – batch production, continuous flow, pull and push systems, Kanban.
- Verification and validation of models.
- Analysis of simulation data and development of improvement plans.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Modelling Exercise explained in a modelling report	2,000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5018	
Module Title	Modelling and Simulation	
Classification	Reading List entry	Electronic*
Essential	Shapiro, J. F. (2007) <i>Modelling the Supply Chain</i> Cincinnati: Thomson Brooks/Cole	☐
Essential	Tipi, N. (2021) <i>Supply Chain Analytics and Modelling: Quantitative Tools and Applications</i> London: Kogan Page	☐
Essential	Banks, J. et al (2013) <i>Discrete Event System Simulation</i> 5 th Ed, Harlow: Pearson	☐
Further	Robinson, S., Kotiadis, K., Brooks, R. J. and van der Zee, D. J. (2011) <i>Conceptual Modeling for Discrete-Event Simulation</i> London: CRC Press	☐
Further	Ebrahimi, M. (ed) (2018) <i>Modeling and Simulation Techniques for Improved Business Processes</i> Hershey PA: IGI Global https://doi-org.ezproxy.uwtsd.ac.uk/10.4018/978-1-5225-3226-2	☒

Module Code	ACMA5019
Title	Procurement Strategies
Date	07/08/2023
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To develop an appreciation of and to critically analyse the application of procurement strategies and policies.

LEARNING OUTCOMES

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

- critically analyse supply strategies and issues;
- evaluate contractual and performance issues in procurement.

INDICATIVE CONTENT

- Supply Strategies.
- Strategic relationships.
- Procurement performance.
- Sustainable Procurement.
- Procurement Contract management.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Assignment	2,000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5019	
Module Title	Procurement Strategies	
Classification	Reading List entry	Electronic*
Essential	Bailey, P. et al, (2008) <i>Procurement: Principles and Management</i> London: FT Prentice Hall	☐
Essential	Lysons, K. and Farrington, B. (2012, 2020) <i>Purchasing and Supply Chain Management</i> (8 th , and 10 th Eds) Harlow: Pearson	☐
Essential	Mena, C. van Hoek, R. and Christopher, M. (2021) <i>Leading Procurement Strategy - Driving Value Through the Supply Chain</i> London: Kogan Page	☐
Further	Crandall, W., Chen, C. C. and Crandall, R. (2015) <i>Principles of Supply Chain Management</i> 2 nd Ed, London: CRC Press	☐
Further	Sabri, E. H. (ed) (2015) <i>Optimization of Supply Chain Management in Contemporary Organizations</i> Hershey PA: Business Science Reference	☐
Further	<i>Journal of Purchasing and Supply Management</i> (2003-2022) Pergamon	☐
Further	Murphy, P. R. and Wood, D. (2008) <i>Contemporary Logistics</i> 9 th Ed, London: Pearson Prentice Hall	☐

Module Code	ACMA5020
Title	Supply Chain and Logistics Operations
Date	07/08/2023
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To analyse supply chain systems and logistics operations that integrate strategic planning, scheduling systems, and transport planning.

LEARNING OUTCOMES

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

- critically assess the development and strategic importance of supply chain operations;
- evaluate logistics operations techniques and practices for innovation in SCM.

INDICATIVE CONTENT

- Logistics operations.
- Supply chain design.
- Transportation planning and optimization.
- Multiple transport modes.
- Schedule logistics operations.
- Innovation in SCM.
- 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

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written assignment	2,000 words	50%

Assessment Component 2

(Tick one)

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Online Exam	2 hours	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5020	
Module Title	Supply Chain and Logistics Operations	
Classification	Reading List entry	Electronic*
Essential	Rushton, A. et al (2017) <i>The Handbook of Logistics and Distribution Management: Understanding the Supply Chain</i> 5 th Ed, London: Kogan Page	☐
Essential	Slack, N. and Brandon-Jones, A. (2019) <i>Operations Management</i> 9 th Ed, Harlow: Pearson	☒
Essential	Russell, R. S. and Taylor, B. W. (2019) <i>Operations and Supply Chain Management</i> 10 th Ed., Chichester: Wiley	☐
Further	Mangan, J. (2016) <i>Global Logistics and Supply Chain Management</i> 2 nd Ed, Chichester: Wiley	☐
Further	Rodrigue, J. P., Notteboom, T. and Shaw, J. (2012) <i>The Handbook of Transport Studies</i> Los Angeles: SAGE	☐
Further	Crandall, W., Chen, C. C. and Crandall, R. (2015) <i>Principles of Supply Chain Management</i> 2 nd Ed, London: CRC Press	☐
Further	Chopra, S. (2019) <i>Supply Chain Management Strategy, Planning, and Operations</i> Harlow: Pearson	☐

Module Code	ACMA5021
Title	Sustainable Supply Chains
Date	07/08/2023
Level	5
Credits	10
Pre-Requisites	None

AIM(S)

- To develop students' awareness and critical understanding of sustainability issues in supply chains.
- To analyse the strategies and practices of achieving circular economy and net zero.

LEARNING OUTCOMES

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

- critically evaluate the impact of sustainability on supply chains.
- analyse ways in which supply chains can achieve decarbonisation and net zero requirements.

INDICATIVE CONTENT

- Sustainability issues in supply chains.
- Sustainable warehousing.
- Product design, cleaner production and packaging.
- Sustainable purchasing and procurement.
- Reverse logistics, recycling, waste and packaging management.
- Risk, resilience and corporate social responsibility.
- Sustainable logistics and supply chain management strategy and practices.
- Circular Economy.
- Decarbonising and Net Zero.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	2,000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5021	
Module Title	Sustainable Supply Chains	
Classification	Reading List entry	Electronic*
Essential	Grant, D. B., Trautrim, A. and Wong, C. Y. (2022) <i>Sustainable Logistics and Supply Chain Management Principles and Practices for Sustainable Operations and Management</i> London: Kogan Page	☐
Essential	Gupta, H. (2020) <i>Barriers and Overcoming Strategies to Supply Chain Sustainability Innovation</i> Elsevier, Amsterdam	☐
Essential	Weenk, E. and Henzen, R. (2021) <i>Mastering the Circular Economy - A Practical Approach to the Circular Business Model Transformation</i> London: Kogan Page	☐
Essential	Weetman, C. (2020) <i>A Circular Economy Handbook -How to Build a More Resilient, Competitive and Sustainable Business</i> London: Kogan Page.	☐
Further	Kovacic, Z., Strand, R. and Völker, T. (2020) <i>The Circular Economy in Europe: Critical Perspectives on Policies and Imaginaries</i> 1 st Ed, London: Routledge https://doi.org/10.4324/9780429061028	☒
Further	Akkucuk, U. (2019) <i>Ethical and Sustainable Supply Chain Management in a Global Context</i> Hershey PA: IGI Global	☒

Further	Heyzer, J. and Render, B. (2014) <i>Operations Management: Sustainability and Supply Chain Management</i> Harlow: Pearson	☒
Further	Atkinson, G., Dietz, S. and Neumayer, E. (2007) <i>Handbook of Sustainable Development</i> Cheltenham: Edward Elgar	☐
Further	Well-being of Future Generations (Wales) Act 2015 (Online). Available at http://www.legislation.gov.uk/anaw/2015/2/contents/enacted	☒

Module Code	ACMA5022
Title	Supply Chain and Logistics Group Project
Date	07/08/2023
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To study the principles of effective research, design and development, leading to a group project involving one or more of the major topic areas of the programme being studied.
- To developing an understanding of research concepts and the development of research competencies, including project management.

LEARNING OUTCOMES

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

- show detailed knowledge and understanding of project management strategies in the planning, researching, implementing and documenting progress and achievement;
- demonstrate subject-specific skills with respect to planning and executing an engineering project within time and budgetary constraints, taking into account the environment and sustainability;
- demonstrate key transferable skills in working as part of a team, including time management, communication and presentation skills.

INDICATIVE CONTENT

- Systematic design and development procedures.
- CAE, CAD and engineering design.
- Research methodologies and techniques.
- Objective design and development selection.
- Project planning.
- Statistical techniques and evaluation.
- Cost prediction, manufacturing and sustainability.
- Quality and reliability.
- Technical report writing.
- Group working and management
- Communication skills

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 will be by means of an interim viva reflecting on progress and project specification followed by a group report and supporting viva documenting the completion of the project carried out.

Assessment Component 1

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Interim Viva	15 minutes	30%

Assessment Component 2

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Final Project Viva	12 minutes	20%

Assessment Component 3

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Project Report	2,500 words (per member of group)	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5022	
Module Title	Supply Chain and Logistics Group Project	
Classification	Reading List entry	Electronic*
Essential	Maylor, H. (2010) <i>Project Management</i> 4 th Ed, Harlow FT Prentice Hall	☐
Further	Seppala, N., (2010) <i>Business Ethics and Corporate Social Responsibility</i> Andover: South-Western Cengage Learning	☐
Further	Masterman, G. (2007) <i>Sponsorship – for a Return on Investment</i> Oxford: Butterworth Heinemann	☐

Module Code	ACMA5024
Title	Computational Techniques 1
Date	06/08/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To equip students with foundational programming skills essential for solving engineering science problems computationally.

LEARNING OUTCOMES

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

- apply and develop basic programming concepts to solve engineering problems computationally.

INDICATIVE CONTENT

- Introduction to programming languages commonly used in engineering (e.g., Python, MATLAB).
- Variables, data types, and operators.
- Control structures: loops and conditional statements.
- Functions and modular programming.
- Introduction to numerical methods: root finding, linear algebraic equations, interpolation, and curve fitting.
- Basics of algorithmic problem-solving techniques.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Documented programme	2500 words or equivalent	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science, and engineering principles.

C3: Select and apply appropriate computational and analytical techniques to model complex problems.

C12: Use practical laboratory and workshop skills to investigate complex problems.

INDICATIVE READING LIST

Module Code	ACMA5024	
Module Title	Computational Techniques 1	
Classification	Reading List entry	Electronic*
Essential	Moore, H. (2019) <i>MATLAB® for engineers</i> . Fifth edition. New York: Pearson.	☐
Essential	Attaway, S. (2022) <i>MATLAB : a practical introduction to programming and problem solving</i> . Sixth edition. Amsterdam: Butterworth-Heinemann.	☒
Essential	Morley, S., (2022) <i>Applying Math with Python: Practical recipes for solving computational math problems using Python programming and its libraries</i> , 2 nd Edition. Birmingham. Packt Publishing,	☐
Further	Wei-Bing Lin, J., (2022) <i>An Introduction to Python Programming for Scientists and Engineers</i> , Cambridge. Cambridge University Press	☐
Further	Musto, J., et al. (2020) <i>Engineering Computation: An Introduction Using Matlab and Excel</i> , 2 nd Edition. New York. McGraw-Hill College	☐
Further	Chapra, S., C., Canale, R., P., (2020) <i>Numerical Methods for Engineers</i> , 8 th Edition. New York. McGraw Hill	☐

Module Code	ACMA5026
Title	Engineering Mathematics 2
Date	06/08/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide students with an understanding of further mathematical techniques, widely used in the Engineering discipline.

LEARNING OUTCOMES

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

- demonstrate an understanding and competency with respect to calculus and its uses in the Engineering discipline;
- solve mathematical problems involving a range of equation forms.

INDICATIVE CONTENT

- Differential calculus and its relationship with engineering problems.
- Partial derivatives.
- Integral calculus and applications.
- Further integral calculus involving advanced techniques such as integration by parts and integration by substitution.
- Complex numbers and their relationship with engineering problems. Manipulation of complex numbers in cartesian and polar form.
- Application of matrices in their solution of multivariable equations.
- An introduction to differential equations.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science, and engineering principles.

INDICATIVE READING LIST

Module Code	ACMA5026	
Module Title	Engineering Mathematics 2	
Classification	Reading List entry	Electronic*
Essential	Smedley, R. and Wiseman, G. (2001) <i>Introducing pure mathematics</i> . 2nd ed. Oxford: Oxford University Press.	☐
Essential	Stroud, K.A. and Booth, D.J. (2020) <i>Engineering mathematics</i> . Eighth edition. London: Red Globe Press.	☐
Essential	Gaulter, B., Gaulter, M., (2001) <i>Further Pure Mathematics</i> Oxford. Oxford University Press	☐

Module Code	ACMA5028
Title	Environmental Engineering and Sustainable Energy
Date	06/08/2025
Level	5
Credits	20
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide students with a comprehensive understanding of environmental engineering principles and the main renewable energy technologies, equipping them with the knowledge and skills to address environmental challenges from sustainable energy solutions.

LEARNING OUTCOMES

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

- demonstrate an understanding of the principles of environmental engineering;
- identify how a range of renewable energy sources can be used to generate electricity while considering engineering, operational, environmental, and economic issues;
- demonstrate an understanding of the application of renewable energy in addressing environmental challenges and promoting sustainable development.

INDICATIVE CONTENT

- Environmental Sustainability and Sustainable Energy.
- Introduction to Environmental Pollution and Pollution Control Principle.
- Environmental Risk Assessment
- Wind Energy
- Solar Energy
- Fuel Cells
- Hydro Power
- Economics of using renewable energy

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

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	2500 words	50%

Assessment Component 2

(Tick one)

☒ 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%

INDICATIVE READING LIST

Module Code	ACMA5028	
Module Title	Environmental Engineering and Sustainable Energy	
Classification	Reading List entry	Electronic*
Essential	Twidell, J. and Weir, A.D. (2022) <i>Renewable energy resources</i> . Fourth edition. London: Routledge.	☐
Essential	Peake, S. and Open University, issuing body (2018) <i>Renewable energy: power for a sustainable future</i> . Fourth edition. Edited by S. Peake. Oxford: Oxford University Press in association with the Open University.	☐
Essential	Mihelcic, J.R., Zimmerman, J.B. and EBSCOhost (2021) <i>Environmental engineering: fundamentals, sustainability, design</i> . Third edition. Hoboken, NJ: John Wiley & Sons, Inc.	☒
Further	Masters, G.M. and Ela, W. (2014) <i>Introduction to environmental engineering and science</i> . 3rd ed., International ed. Harlow: Pearson Education.	☐

Module Code	ACMA5028	
Module Title	Environmental Engineering and Sustainable Energy	
Classification	Reading List entry	Electronic*
Further	Breeze, P.A. (2014) <i>Power generation technologies</i> . Second edition. Amsterdam: Newnes.	☐
Further	Andrews, J. and Jelley, N.A. (2022) <i>Energy science : principles, technologies, and impacts</i> . Fourth edition. Oxford [England] ; Oxford University Press.	☐
Further	Burton, T. <i>et al.</i> (2021) <i>Wind energy handbook</i> . Third edition. Hoboken, NJ: Wiley.	☒
Further	Jäger, K.-D. <i>et al.</i> (2016) <i>Solar energy : the physics and engineering of photovoltaic conversion, technologies and systems</i> . Cambridge: UIT Cambridge.	☒
Further	Everett, B. and Open University. (2012) <i>Energy systems and sustainability : power for a sustainable future</i> . 2nd ed. / edited by Bob Everett ... [et al.]. Oxford: Oxford University Press.	☐
Further	Davis, M.L. and Cornwell, D.A. (2022) <i>Introduction to environmental engineering</i> . Sixth edition. New York, N.Y: McGraw-Hill.	☐
Further	Franchetti, M.J. and Apul, D. (2013) <i>Carbon footprint analysis : concepts, methods, implementation, and case studies</i> . Boca Raton, FL: Taylor & Francis.	☐
Further	Wagner, H.-J. and Mathur, J. (2011) <i>Introduction to hydro energy systems : basics, technology and operation</i> . Berlin ; Springer.	☒
Further	www.defra.gov.uk	☒
Further	www.environmental-agency.gov.uk	☒
Further	www.ciwem.co.uk	☒
Further	www.water-pollution.org.uk	☒

Module Code	ACMA5029
Title	Group Project
Date	06/08/2025
Level	5
Credits	20
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide students with the opportunity to apply engineering principles and techniques to solve a real-world problem. Through a collaborative group project, involving theoretical and practical aspects, students will develop their technical, project management and communication skills.

LEARNING OUTCOMES

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

- apply engineering principles and design methodologies, propose solutions to discipline specific challenges, use management strategies within time and budget constraints, considering environmental impacts and sustainability by executing a project;
- demonstrate the ability to work effectively as part of a team, exhibiting key communication, leadership, collaboration and time management skills.

INDICATIVE CONTENT

- Systematic Design and Development Procedures (including decision-making tools).
- Research Methodologies and Techniques.
- Project Planning and Management (including project management software).
- Risk Management in Engineering Projects (including relevant statistical tools).
- Cost Prediction, Manufacturing, and Sustainability.
- Quality and Reliability.
- Engineering Ethics, Regulatory Frameworks, and Professional Responsibility.
- Leadership and Team Dynamics.
- Communication Methods and Skills.
- Technical Report Writing.
- Group Working and Management.
- Sector-Specific Case Studies.
- Reflective Practice and Project Evaluation.

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

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Interim Viva (Group presentation)	6 minutes (per person)	30%

Assessment Component 2

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Final Project Viva	4 minutes (per person)	20%

Assessment Component 3

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written project report	2500 words (per person)	50%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **assessed** in this module:

C16: Function effectively as an individual, and as a member or leader of a team.

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C4: Select and evaluate technical literature and other sources or information to address complex problems.

C5: Design solutions for complex problems that meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health and safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards.

C9: Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity.

C10: Adopt a holistic and proportionate approach to the mitigation of security risks.

C11: Adopt an inclusive approach to engineering practice and recognise the responsibilities, benefits and importance of supporting equality, diversity and inclusion.

C13: Select and apply appropriate materials, equipment, engineering technologies, and processes, recognising their limitations.

C15: Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights.

C17: Communicate effectively on complex engineering matters with technical and non-technical audiences.

INDICATIVE READING LIST

Module Code	ACMA5029	
Module Title	Group Project	
Classification	Reading List entry	Electronic*
Essential	Maylor, H. and Turner, N. (2022) <i>Project management</i> . Fifth edition. Harlow: Pearson.	☐
Essential	Griseri, P., & Seppala, N., (201) <i>Business Ethics and Corporate Social Responsibility</i> Andover. Cengage Learning EMEA.	☐
Essential	Blowfield, M. and Murray, A. (2019) <i>Corporate social responsibility</i> . Fourth edition. Oxford: Oxford University Press.	☐

Module Code	ACMA5030
Title	Laboratory Skills for Materials 2
Date	06/08/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To continue to develop an understanding of working with various materials in a laboratory environment and gain practical experience in the testing and analysis of materials and their properties.

LEARNING OUTCOMES

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

- work safely in a laboratory setting by themselves and with others;
- demonstrate various analytical techniques commonly used in materials science settings.

INDICATIVE CONTENT

- Mechanical testing of ceramics and polymers
- Overview of creep and fatigue testing
- Introduction to X-ray diffraction
- Spectroscopy of metals, ceramics and polymers

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	2500 Words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5030	
Module Title	Laboratory Skills for Materials 2	
Classification	Reading List entry	Electronic*
Essential	Callister, W.D. and Rethwisch, D.G. (2020) <i>Materials science and engineering : an introduction</i> . 10th edition. Hoboken, NJ: Wiley.	☐
Essential	Jones, D.R.H. and Ashby, M.F. (2019) <i>Engineering materials 1 : an introduction to properties, applications and design</i> . Fifth edition / David R.H. Jones, Michael F. Ashby. Oxford: Butterworth-Heinemann.	☒
Further	Schrader, G.F. <i>et al.</i> (2000) <i>Manufacturing processes & materials</i> . Fourth edition. Dearborn, Mich: Society of Manufacturing Engineers.	☐
Further	Creese, R.C. (1999) <i>Introduction to manufacturing processes and materials</i> . New York: Marcel Dekker.	☐
Further	Ashby, M.F. and Jones, D.R.H. (2013) <i>Engineering materials 2 : an introduction to microstructures and processing</i> . Fourth edition. Oxford: Butterworth-Heinemann.	☒
Further	White, M.A. (2019) <i>Physical properties of materials</i> . Third edition. Boca Raton, FL: CRC Press, Taylor & Francis Group.	☐

Module Code	ACMA5033
Title	Manufacturing Design and Sustainable Technology
Date	06/08/2025
Level	5
Credits	20
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To enable students to develop an understanding of a wide range of variables relating to both primary and secondary manufacturing processes including recognising typical process defects and to propose appropriate preventative and remedial methods of dealing with these defects.
- To enable the student to critically appraise a range of factors affecting the design process and to apply suitable techniques to arrive at design solutions and develop appropriate solutions to engineering problems, using new or existing design techniques, and understanding of sustainability in an industrial context.

LEARNING OUTCOMES

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

- apply appropriate design methodologies and utilize advanced features of 3D CAD software to develop effective engineering design solutions;
- evaluate existing manufacturing processes to identify opportunities for improvement through lean principles, waste reduction, and sustainable practices.

INDICATIVE CONTENT

- Design Algorithms including Design for Six Sigma and Total Design.
- Overview of design tools including Quality Function Deployment.
- Mechanical tolerance calculations and tolerance stack-up analysis including GD&T.
- Plastic Injection analysis and Motion Simulation and Animation.
- Primary processes. – casting (mould design, feeding mechanisms, metallurgical considerations, casting systems and defects: deformation processes-rolling theory, forging, extrusion and drawing (die-design, process parameters, and defects).
- Computer-Aided Manufacturing Technologies and applications including Computer Numerical Control Principles.
- Polymeric and ceramic material processing (Mould design, process parameters and defects).
- Role of Additive Manufacturing in the product development process and future applications and development of the technology.

- Design for Additive Manufacturing, including part consolidation and redesign. Looking at the unique capabilities of shape, functional and material complexities.
- Materials and the environment: Recycling, corrosion, UV degradation, hygroscopy.
- Material failure: Fatigue, creep and fracture, crack criteria, stress concentration factors, residual stresses. Preventative measures and design implications.
- Lean Manufacturing Principles.
- Sustainable Manufacturing Practices.
- Sustainability Assessment Tools.

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

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Design project	5000 words	100%

Assessment Summary

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

Engineering Council AHEP4 Learning Outcomes **developed** in this module:

C1: Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study.

C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science, and engineering principles.

C5: Design solutions for complex problems that meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health and safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards.

C7: Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts.

C8: Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.

C13: Select and apply appropriate materials, equipment, engineering technologies, and processes, recognising their limitations.

C14: Discuss the role of quality management systems and continuous improvement in the context of complex problems.

C15: Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights.

INDICATIVE READING LIST

Module Code	ACMA5033	
Module Title	Manufacturing Design and Sustainable Technology	
Classification	Reading List entry	Electronic*
Essential	Allen, D.T., & Shonnard, D.R., (2011) <i>Sustainable Engineering: Concepts, Design and Case Studies</i> London. Pearson	☐
Essential	Pugh, S. (1990) <i>Total design : integrated methods for successful product engineering</i> . Wokingham: Addison-Wesley.	☐
Essential	Groover, M.P. (2013) <i>Principles of modern manufacturing :bSI version</i> . Fifth edition. Singapore: Wiley.	☒
Essential	Xiaozhong, R., (2021) <i>Fundamentals of Manufacturing Technology</i> , Oxford. Alpha Science International Ltd	☐
Further	Chanda, M. and Roy, S.K. (2009) <i>Plastics fundamentals, properties, and testing</i> . Boca Raton: CRC Press.	☐
Further	Milewski, J.O., (2017) <i>Additive Manufacturing of Metals: From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewelry</i> . New York. Springer.	☒
Further	Campbell, J. (2015) <i>Complete casting handbook : metal casting processes, metallurgy, techniques and design</i> . 2 nd Edition. Oxford: Butterworth-Heinemann.	☒
Further	Gebhardt, A. (2012) <i>Understanding additive manufacturing : rapid prototyping - rapid tooling - rapid manufacturing</i> . Munich: Hanser Publishers.	☒
Further	Bitonti, F. (2019) <i>3D printing design : additive manufacturing and the materials revolution</i> . London: Bloomsbury Visual Arts.	☒
Further	Locke, R.M. and Wellhausen, R.L. (2014) <i>Production in the innovation economy</i> . Cambridge, Massachusetts: MIT Press.	☒

Module Code	ACMA5036
Title	Mechanical Properties of Materials 2
Date	06/08/2025
Level	5
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To further develop students' knowledge of the mechanical properties of various materials and covering more complex loading states of creep, fatigue, fracture and heat treatment of materials.

LEARNING OUTCOMES

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

- analyse and interpret various loading states for different materials and their outcomes;
- demonstrate an understanding of design for prevention of failure through fatigue, creep, and corrosive environments.

INDICATIVE CONTENT

- Complex phase diagrams for metals and ceramics.
- Heat treatment of metals including TTT diagrams, annealing, aging of metals and their alloys.
- Fatigue loading and fracture.
- Creep loading and fracture.
- Mechanical testing of polymers and composites.
- Case studies of metal, ceramic, polymer, and composite examples.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

(Tick one)

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5036	
Module Title	Mechanical Properties of Materials 2	
Classification	Reading List entry	Electronic*
Essential	Callister, W.D. and Rethwisch, D.G. (2020) <i>Materials science and engineering : an introduction</i> . 10th edition. Hoboken, NJ: Wiley.	☐
Essential	Jones, D.R.H. and Ashby, M.F. (2019) <i>Engineering materials 1 : an introduction to properties, applications and design</i> . Fifth edition / David R.H. Jones, Michael F. Ashby. Oxford: Butterworth-Heinemann.	☒
Essential	Ashby, M.F. and Jones, D.R.H. (2013) <i>Engineering materials 2 : an introduction to microstructures and processing</i> . Fourth edition. Oxford: Butterworth-Heinemann.	☒
Further	Ashby, M.F. and Johnson, K. (2014) <i>Materials and design : the art and science of material selection in product design</i> . Third edition. Oxford: Butterworth-Heinemann.	☒
Further	Schrader, G.F. <i>et al.</i> (2000) <i>Manufacturing processes & materials</i> . Fourth edition. Dearborn, Mich: Society of Manufacturing Engineers.	☒
Further	Creese, R.C. (1999) <i>Introduction to manufacturing processes and materials</i> . New York: Marcel Dekker.	☐
Further	White, M.A. (2019) <i>Physical properties of materials</i> . Third edition. Boca Raton, FL: CRC Press, Taylor & Francis Group.	☐

Module Code	ACMB5005
Title	Six Sigma Green Belt
Date	12/07/2024
Level	5
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
SM2b	Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems
*SM3b	Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline
EA4b	Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems
P7	Awareness of quality issues and their application to continuous improvement

*Only applies to Materials Science programme

AIM(S)

- To enable the student to apply the DMAIC problem-solving methodology to a green belt standard on a product/service, process operation.

LEARNING OUTCOMES

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

- Demonstrate a range of tools and techniques when applying the six sigma DMAIC methodology to a chosen problem
- Design and execute a Six Sigma Green Belt project

INDICATIVE CONTENT

- Six Sigma- what is it, benefits and weaknesses applications and its uses
- Define – Developing problem statements, the customer, project charter, process mapping
- Measure – Sources of variation, FMEA analysis, data collection, process capability and measurements system analysis
- Analyse – graphical tools, roots cause analysis, sources of variation and review analysis methods
- Improve – generate improvement alternative, improve FMEA phase, cost/benefit analysis, future state process map, piloting and validate improvements
- Control – Develop control strategy, develop control plan and SOP and training plan
- Quality tools and techniques – Pareto Analysis, Cause and Effect analysis, Process Mapping, Gage R & R studies, capability studies, FMEA and data collection analysis
- Quality systems – their role in assuring quality and business management, principles of quality management and different quality standards (ISO 9001: 2015, ISO 17025 and TS/ISO 16949)

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
Coursework	5000 words	100%

AHEP3 Version 3 outcomes to be met in this assessment:
SM2b, EA4b, P7

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMB5005	
Module Title	Six Sigma Green Belt	
Classification	Reading List entry	Electronic*
Essential	Pyzdek, T (2018) The Six Sigma Handbook, 5 th Edition, McGraw Hill Education, United States	☐
Essential	Muroe, A (2007) The Certified Six Sigma Green Belt Handbook, ASQ Quality Press, Milwaukee	☐
Essential	Bicheno, J and Holweg, M (2016) The Lean Toolbox, 5 th Edition, Picsie Books, Buckingham	☐
Further	Dale, B. Bamford, D and Van der Wiele, T (2016) Managing Quality: An Essential Guide and Resource Gateway, 6 th Edition, John Wiley & Sons, Chichester	☐
Further	Russell, R.S (2009) Operations Management, John Wiley & Sons, USA	☐

Further	Trivium (2019) Six Sigma Green Belt Study Guide 2019: Trivium Test Prep	☐
Further	Setter, C (2018) Six Sigma: A Complete Step-by-Step Guide, Council for Six Sigma Certification, Buffalo	☐
Further	Barsalou, M (2014) Root Cause Analysis, Productivity Press, Boca Raton	☐
Further	Sartor, M and Orzes, G (2019) Quality Management: Tools, Methods and Standards, Emerald Publishing Limited, Bingley	☐
Further	Slack, N and Brandon-Jones, A (2019) Operations Management, 9 th Edition, Pearson, Harlow	☐
Further	Stevenson, W (2018) Operations Management, McGraw Hill Education, New York	☐
Further	Computers and Industrial Engineering	☒
Further	European Journal of Operations Research	☒
Further	International Journal of Production Economics	☒
Further	International Journal for Project Management	☒
Further	Journal of Cleaner Production	☒
Further	Journal of Manufacturing Systems	☒
Further	Journal of Operations Management	☒
Further	Journal of Purchasing and Supply Management	☒
Further	Operations Research Perspectives	☒
Further	Reliability Engineering and System Safety	☒
Further	www.quality.org	☒
Further	www.asp.org	☒
Further	www.isixsigma.com	☒
Further	www.cips.org	☒