

MODULE DIRECTORY

LEVEL 3/4

ACADEMIC DISCIPLINE OF ENGINEERING

WALES INSTITUTE OF SCIENCE AND ART

2023-2024

CONTENTS PAGE

	Page No
INTRODUCTION.....	1
MODULES	2

INTRODUCTION

This Module Directory includes all the modules for Level 3/4 within the Engineering in the academic year 2023-2024.

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

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

MODULES

Module Code	ACBA4014
Title	Group Project for CertHE
Date	04/08/2023
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To enable students to apply the knowledge they have gained through the modules they have studied, in the development of project. The product of the project will take the form of a subject related application which may be a software application, electronics application, design, etc.

LEARNING OUTCOMES

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

- apply the knowledge and skills gained through their study to solve problems as a team;
- understand and implement project life cycle, recognise project purpose, tools and techniques and the context.

INDICATIVE CONTENT

- Product Lifecycle- Project Initiation to Project Closure.
- Literature review and requirements gathering.
- Research and development methodologies.
- Ethical issues and Sustainability issues.
- Development of documentation for academic projects.
- Presentation of work produced to an academic audience.

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
Report	2000 words	60%

Assessment Component 2

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Presentation or Demonstration	Approx 10 minutes	40%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	60%
Practical	40%
TOTAL	100%

INDICATIVE READING LIST

Module Code	ACBA4014	
Module Title	Group Project for CertHE	
Classification	Reading List entry	Electronic*
Essential	Larson, E.W. (2020) <i>Project Management</i> . 8th Edition. McGraw-Hill	☒
Further	Newton, R. (2016), <i>Project Management Step by Step</i> , FT Publishing International	☒
Further	Hughes, B. (2019), <i>Project Management for IT-Related Projects</i> . 3rd Edition. British Computer Society	☒
Further	Christopher, D (2016) <i>Projects in Computing and Information Systems, a student's guide</i> , Pearson Education	☐
Further	Berndtsson, T (2013) <i>Planning and Implementing your Project</i> , Springer Verlag	☐
Further	Cottrell, S.(2011) <i>Critical Thinking Skills: Developing Effective Analysis and Argument</i> , Palgrave Macmillan	☐
Further	Collis, J., Hussey, R (2013) <i>Business Research: a Practical Guide for Undergraduate and Postgraduate Students</i> , Palgrave Macmillan	☐

Module Code	ACCA4030
Title	Digital Technologies
Date	24/02/2021
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To provide students with knowledge and practical skills in a range of industry standard digital technologies to support effective and efficient work-flow.

LEARNING OUTCOMES

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

- Demonstrate essential knowledge and skills to use software packages and applications to support day-to-day business operations.

INDICATIVE CONTENT

- Working with personal computers, tablets and mobile devices
- Operating system: Windows, Mac, OS, Android, Linux, etc
- Internet and web technologies
- software packages and installations
- Office software products
- Emails and other communication tools
- Online collaboration tools - SharePoint, Skype for Business, MS Teams.
- Remote working and VPN
- Data storage, security and compliance
- Latest trends

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

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Portfolio Students will produce a portfolio of work appropriate to the nature of their area of study. Portfolio elements may include a selection of the following: • Written Report • Software implementation • Demonstration of work	2,000 words equivalent	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACCA4030	
Module Title	Digital Technologies	
Classification	Reading List entry	Electronic*
Essential	J. T. Campbell, S. M. Freund, M. Frydenberg, M. Z. Last, P. J. Pratt, S. L. Sebok, M. E. Vermaat (2017) Shelly Cashman Series Discovering Computers & Microsoft Office 365 & Office 2016: A Fundamental Combined Approach, 1st Edition	☒
Further	P. Carey, K. T. Pinard, A. Shaffer, M. Shellman, S. Vodnik (2020) New Perspectives Microsoft Office 365 & Office 2019 Introductory, 1st Edition	☒

Module Code	ACDA4024
Title	Skills for Academic Success
Date	04/08/2023
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with essential transferable knowledge and practical skills needed for success in an academic and employment environment, that support independent lifelong learning and development.

LEARNING OUTCOMES

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

- demonstrate an understanding and application of academic and professional concepts and transferable skills and communicate results in a professional manner;
- demonstrate the principles and systematic understanding of effective Team-working and use suitable contemporary collaborative technology to support group work.

INDICATIVE CONTENT

- Understand the learning process, reflection and life-long learning.
- Gathering relevant information e.g. note taking, using the library and online resources.
- Strategies for essay and report writing.
- Academic and Professional writing e.g. planning and structuring reports and presentations.
- Creating a sustainable document repository and backing up files.
- Developing confidence in being able to communicate effectively.
- Communicating and presenting information e.g. presentation tools and techniques.
- Understanding Plagiarism and Unfair Practice issues.
- The importance of referencing & standard referencing styles.
- Self-reflection.
- Identifying goals and creating action plans.
- Self-evaluation skills.

- Self-management and self-regulation e.g. time management, organising space and resources, professional attitude, emotional intelligence, stress management, personal health and wellbeing.
- Developing applied knowledge of suitable software tools that help with academic work such as the use of research databases, Office software and referencing tools.
- Apply professional skills learned to the area of study.
- Gaining relevant academic and professional skills specific to the programme stream.
- Online etiquette 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 Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	2000 words	50%

Assessment Component 2

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Presentation	5-10 minutes individual or equivalent if group-work. Delivered live or recorded video presentation.	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACDA4024	
Module Title	Skills for Academic Success	
Classification	Reading List entry	Electronic*
Essential	Osmond, A (2015) Academic Writing and Grammar for Students 2 nd Edition, Palgrave Macmillan	☒
Essential	Pears, R, Shields, G (2022) Cite Them Right: The Essential Referencing Guide, 12 th Edition, Palgrave Macmillan	☒
Essential	UWTSD Library Referencing Handbooks, available at: https://www.uwtsd.ac.uk/library/student-essentials/referencing-handbooks/	☒
Further	Cottrell, S (2019) The Study Skills Handbook, SAGE Publications Ltd	☒
Further	Gillett, A (2009) Inside Track to Successful Academic Writing, Longman	☐
Further	Greetham, B (2018) How to Write Better Essays 4 th Edition, Palgrave Macmillan	☐
Further	Cottrell, S (2011) Critical Thinking Skills: Developing Effective Analysis and Argument, Palgrave Macmillan	☐
Further	Hall, A and Hall, K (2021) Leading remote and virtual teams: Managing yourself and others in remote and hybrid teams or when working from home, Global Integration Ltd	☒
Further	Jelphs, K (2016) Working in teams, Policy Press	☐

MODULE CODE: ACDB4002
TITLE: Electrical and Electronic Principles
DATED: 16/08/2018

LEVEL: 4
CREDITS: 20

JACS CODE: H610

AIM(S)

To understand the fundamental operation of common analogue and digital components and circuits.

LEARNING OUTCOMES

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

1. Investigate and analyse basic analogue and digital electronic circuits encountered during the course.
2. Apply appropriate software techniques (e.g. Multisim / Proteus) to simulate basic circuits.
3. Perform practical exercises to deploy test equipment, perform measurements and present results.

INDICATIVE CONTENT

- Use of simulation software such as Multisim or Proteus
- Definitions of Current, Voltage, Resistance, Power etc
- Series and parallel circuits
- Passive devices, resistors, capacitors, coils etc.
- Semiconductor devices e.g. diodes, transistors etc
- Amplifier principles, frequency response curves , input and output impedance
- Thevenin Equivalent Circuits
- Basic DC and AC theory, simple power supplies.
- Op-amps, basic configurations
- Passive filters
- Electromagnetism
- Timing and clock Circuits, RC, crystal oscillator modules etc.
- Transistor as a switch
- Commonly used ICs as building blocks, 555, 741, 7805 etc.
- Basic logic gates and configurations
- Boolean Algebra
- Combinational logic applications

LEARNING AND TEACHING STRATEGY

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Coursework assignment	2500 words	50%

Assessment Summary

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

READING LIST

Module Code	ACDB4002	
Module Title	Electrical & Electronic Principles	
Classification	Reading List entry	Electronic*
Essential	Electrical and Electronic Principles and Technology, John Bird, Routledge; 6 edition (6 Mar. 2017)	☒
Further	Electronic and Electrical Engineering: Principles and Practice, Electronic, Lionel Warnes, Palgrave Macmillan; 3rd Edition (13 Dec. 2002)	☒

Module Code	ACHA3000
Title	Introduction to Mathematics and Science
Date	14/05/2020
Level	3
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with a sound understanding of mathematical and scientific principles.

LEARNING OUTCOMES

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

- Apply fundamental mathematical principles to a level that underpins the knowledge required for further study at a higher level.
- Identify and apply appropriate physical principles and relationships in the solution of problems

INDICATIVE CONTENT

- Introduction to basic fractions, indices and standard form
- Introduction to the transposition of formulae
- Solution of linear equations
- Solution of quadratic equations
- Solution of simultaneous equations
- Introduction to trigonometry and right-angled triangles (SOHCAHTOA)
- An introduction to vectors
- Units - basic SI units of length, mass and time, area and volume, density and relative density, mass and weight, force, work and power.
- Forces and moments - conditions of static equilibrium, forces and reaction, especially simply supported beams. Moments of a form. Resultant, couples, centre of gravity. Vector rotation. Resolution of forces. Polygon of forces.
- Electrical current/voltage. Mechanical analogies. Resistors in series and parallel. The heating effect of current, variation of resistance with temperature incandescent lamp.
- Voltage divider and current divider. Simple circuit calculations, use of Ohm's law and Kirchhoff's laws.

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 Exam	1 hour	50%

Assessment Component 2

(Tick one)

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Exam	1 hour	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACHA3000	
Module Title	Introduction to Mathematics and Science	
Classification	Reading List entry	Electronic*
Essential	Smedley, R., Wiseman, G., Introducing Pure Mathematics (Oxford, 2001)	☐
Essential	Stroud, K.A. - <i>Engineering Mathematics</i> , (Palgrave Macmillan, 2013)	☒
Further	Davies, H; Hicks, A, Mathematics for Scientific and Technical Students (1998)	☐
Further	Stroud, K A, (2007) Engineering Mathematics, Industrial Press	☐
Further	McDonagh, I. and Waterworth (2015), G. Engineering Science Volumes 1 and 2, Arnold	☒
Further	Bird, J. O. and Ross, C. (2012) Mechanical Engineering Principles, Routledge	☐

Further	Bird, J, (2006) Higher Engineering Mathematics, Newnes	☐
Further	McDonagh, I., Mechanical Science for Technicians Volume 1, Arnold	☐
Further	Hannah, J. and Hillier, M.(1999) Mechanical Engineering Science, Longman	☐
Further	Bird, J. O. and Ross, C.(2012) Mechanical Engineering Principles, Routledge	☐
Reference	www.khanacademy.org	☒

Module Code	ACHA4000
Title	Analytical Methods
Date	17/09/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To introduce the student to the mathematical ideas and techniques necessary for an understanding of the mathematics encountered in further engineering modules

LEARNING OUTCOMES

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

- demonstrate understanding and competency with respect to a range of algebra and functions mathematical techniques which are the basis of the mathematics required in engineering; calculus, types of integrals, manipulation of matrices and complex number theory, cartesian and polar form and manipulation of complex numbers

INDICATIVE CONTENT

- Solution of linear, quadratic and simultaneous equations
- Transposition of formula
- Solution of indicial and logarithmic equations using the laws of logarithms
- Trigonometry, Sine and Cosine rule, solution of trigonometric equations
- Logarithms and their use in solution of indicial and logarithmic equations
- Statistical methods including standard deviation, averages, sample distribution, standard error, sample variance.
- Differential calculus: standard rules; simple partial differentiation
- Integral calculus: definite and indefinite integrals; standard integrals; integration by parts; integration by substitution;
- Complex numbers: algebra and manipulation; Argand diagram; polar form; De Moivre's theorem
- Differentiation: maxima, minima and points of inflection; standard derivatives and the rules of differentiation;
- Matrix algebra: manipulation of matrices, determinants, solution of simultaneous equations using Cramer's method
- Statistical analysis of engineering data
- Design of experiment methods

- Application of MATLAB to solve engineering principles

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	2000 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	1.5 hours	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM2b, EA3b

INDICATIVE READING LIST

Module Code	ACHA4000	
Module Title	Analytical Methods	
Classification	Reading List entry	Electronic
Essential	Singh, K., Engineering Mathematics through Applications (Red Globe Press, 2011)	☐
Essential	Stroud, K. A., Engineering Mathematics (Palgrave Macmillan, 2007)	☐
Further	Smedley, R., Wiseman, G., Introducing Pure Mathematics (Oxford, 2001)	☐
Further	Rouvel, J., Automotive Mathematics (Pearson/Prentice Hall, 2005)	☐
Further	Sizemore, J., MATLAB for dummies (John Wiley & Sons, 2015)	☒
Reference	https://matlabacademy.mathworks.com/	☒

Module Code	ACHA4001
Title	Engineering Design & Materials
Date	17/09/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To introduce students to both 2D and 3D Computer Aided Design, Drafting and Solid Modelling and a familiarity with the engineering design process and to give an understanding of the theory and application of design methodologies and processes.
- To develop a knowledge base and understanding of the structure, properties and basic selection of classes of materials and appreciation of the processes used in the manufacture of components with a view to providing basic process selection parameters

LEARNING OUTCOMES

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

- Show knowledge and understanding of design methodologies and processes (problem definition/decision making/communication etc.)
- Demonstrate skills in communicating the design, material and manufacturing of products through the preparation and interpretation of Engineering Drawings to BS8888 through the medium of 2D and 3D CAD tools. Including cognitive skills to allow choice of material and manufacturing processes to meet specific design criteria.

INDICATIVE CONTENT

- Methodologies for the generation of design solutions to conceptual and adaptive design problems, to include; creativity, innovation, evaluation, optimisation, design isolation, manufacture, reliability, sustainability, safety and cost implications.
- Engineering Graphics – basic sketching and drawing skills in the creation and interpretation of engineering drawings. British Standard 8888 (or equivalent standard).
- Computer Aided Drawing – introduction to the use of Solidworks (or equivalent software) for the creation of 3D parametric solid models, assemblies and 2D engineering drawings.
- Material properties and material selection using Granta EduPack material selection software.
- Introduction to primary and secondary manufacturing processes.
- Tolerancing principles, limit and fit calculations, geometric dimensioning and tolerancing theory and applications

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Practical Assessment	2 Hour Assessment	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Technical Report	2000-word report	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

SM3b, EA1b, EA4b, D1, D2, D4, D5, D6, EL2, EL4, P2, P3, P6, P7, G1, G4

INDICATIVE READING LIST

Module Code	ACHA4001	
Module Title	Engineering Design & Materials	
Classification	Reading List entry	Electronic*
Essential	Pugh S - Total Design: Integrated Methods for Successful Product Engineering, (Prentice Hall, 1990)	☐
Essential	Madsen, D., Engineering Drawing and Design (Cengage Delmar Learning, 2016)	☒
Essential	Pahl G et al , Engineering Design: A Systematic Approach, (Springer, 2006)	☐
Essential	Lombard M , Solidworks 2013 bible, (Wiley,2013)	☒

Further	Ullman DG - The Mechanical Design Process, 6 th Edition, (David Ullman LLC, 2017)	☒
Further	Geng, H., Manufacturing Engineering Handbook, 2 nd Edition, (McGraw-Hill Education, 2015)	☐
Further	Ashby, M., Materials Selection in Mechanical Design, 5 th Edition, (Butterworth-Heinemann 2016)	☒
Further	Walker, S., Sustainable by Design: Explorations in Theory and Practice, (Routledge, 2006)	☐
Further	Budynas, R., Shigley's Mechanical Engineering Design (McGraw-Hill Education, 2014)	☐
Further	Science Direct (https://www.sciencedirect.com/)	☒

Module Code	ACHA4002
Title	Engineering Science
Date	17/09/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To provide a basic understanding of the principles and applications associated with general aspects of mechanical engineering science

LEARNING OUTCOMES

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

- Demonstrate a detailed knowledge and understanding of key relevant engineering principles in structures and dynamics analysis, and an understanding of modelling and solving numerical problems of both.
- Present an ability to apply appropriate key transferable skills and theoretical and practical methods to the analysis and solution of structures and dynamics engineering problems including decision making, interpreting experimental results.
- Show cognitive skills with respect to modelling and simplifying real problems, and applying mathematical methods of analysis.

INDICATIVE CONTENT

- Statics & Dynamics
 - Resolution of forces
 - Moments and static equilibrium
 - Free body force diagrams
- Dynamics
 - Laws of motion
 - Linear and angular motion
 - Work, Energy & Power
 - Springs and Hooke's Law
 - Mass, Moments of Inertia
- Structures
 - Stress, Strain, Young's Modulus
 - Simple Torsion
 - Simple Bending
 - Shear force and bending moment diagrams
 - Pin jointed frames
 - Euler's Buckling Equation
- Introductory Thermodynamics
 - Heat transfer
 - Gas Laws

- Introductory Fluid Mechanics
 - Volumetric Flow Rate
 - Bernoulli's Equation
 - Laminar and Turbulent Flow

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	2000 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	1.5 hours	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, EA1b, P1, P3

INDICATIVE READING LIST

Module Code	ACHA4002	
Module Title	Engineering Science	
Classification	Reading List entry	Electronic*
Essential	Zammit, S.J, Motor Vehicle Engineering Science for Technicians (Longman Technical Series, 1987)	☐
Essential	Twigg, P, Science for Motor Vehicle Engineers (Butterworth Heinmann, 1995)	☐
Further	Bird, J, Science for Engineering (Routledge, 2015)	☒
Further	Bolton, W, Engineering Science (Routledge, 2015)	☒

Module Code	ACHA4003
Title	Motorcycle Technology
Date	17/09/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To introduce the student to the technical aspects of motorcycle technology and the basics of motorcycle dynamics and vehicle performance

LEARNING OUTCOMES

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

- show a detailed knowledge and understanding of the underlying principles of motorcycle systems and powertrain technologies and their future developments and implementation as a sustainable product including problem solving and the interpretation of experimental data to assess validity of solutions proposed
- show cognitive skills with respect to simplification and modelling of real motorcycle problems, the application of fundamental mechanical engineering principles and the analysis of problems and making recommendations on findings

INDICATIVE CONTENT

- Motorcycle dynamics and handling
- Motorcycle kinematics
- Geometry and its importance
- Suspension properties and vehicle setup.
- Technical measurement and analysis
- Motorcycle modelling and simulation
- Basic tyre properties
- Fundamental motorcycle design and industry sustainability
- Engine design features
- Engine types and operation
- Cylinder head flow characteristics
- Dynamometer testing
- Transmission specification using numerical techniques

- Chassis design features
- Chassis construction techniques
- Manufacturing techniques

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Coursework	2000 words	50%

Assessment Component 2

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Practical work	2 Hours Laboratory Based Assessment	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, P1, P3

INDICATIVE READING LIST

Module Code	ACHA4003	
Module Title	Motorcycle Technology	
Classification	Reading List entry	Electronic*
Essential	Bradley, J., The Racing Motorcycle: A Technical Guide for Constructors volumes 1 and 2, (Broadband Leisure Publications, 2003)	☐
Essential	Spalding, N., MotoGP Technology 3rd Edition, Phoebus Apollo Publishing Limited, 2017	☐
Further	Foale, T., Motorcycle Handling and Chassis Design (Tony Foale, 2002)	☐
Further	Cocco, G., Motorcycle Design and Technology (Giorgio NADA Editore, Dec 2005)	☐
Reference	http://2d-datarecording.com/en/downloads/manuals	☒
Reference	https://motochassis.com	☒

Module Code	ACHA4004
Title	Vehicle Technology
Date	17/09/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To allow the student to acquire knowledge of a range of Automotive powertrain, suspension, control and chassis systems through lectures and practical investigations

LEARNING OUTCOMES

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

- Show a detailed knowledge and understanding of the underlying principles of engine and vehicle technologies and practices for analysis of powertrain and chassis systems in automotive applications
- demonstrate subject specific practical and cognitive skills applied to an automotive problem, obtaining and interpreting data in a laboratory environment and drawing relevant conclusions

INDICATIVE CONTENT

- Tyre construction and performance
- Tyre slip angles
- Car suspension systems design parameters, geometries and performance characteristics
- Vehicle suspension as a kinematic system
- Load transfer under longitudinal and lateral acceleration
- Steering & Braking systems
- Basic aerodynamic principles
- Engine design features
- Engine types and operation
- Cylinder head flow characteristics
- Dynamometer testing
- Measurement of vehicle suspension systems
- Transmission specification using numerical techniques

- Chassis design features
- Chassis construction techniques
- Manufacturing techniques

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written technical report	2000 words	50%

Assessment Component 2

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Practical work	2 Hours Laboratory Based Assessment	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, P1, P3

INDICATIVE READING LIST

Module Code	ACHA4004	
Module Title	Vehicle Technology	
Classification	Reading List entry	Electronic*
Essential	Stone, R., Introduction to Internal Combustion Engines (Macmillan, 1999)	☐
Essential	Hillier, V., and Coombes, P., Fundamentals of Motor Vehicle Technology (Stanley Thornes, 2004)	☐
Essential	Schüetz, T. (2016). Aerodynamics of road vehicles (Fifth ed.).	☐
Further	Barnard, R. (2001). Road vehicle aerodynamic design: An introduction (2nd ed.). St Albans: Mechaero.	☐
Further	Heywood, J., Internal Combustion Engine Fundamentals (McGraw Hill, 1989)	☐
Further	Pacejka, H. (2006). <i>Tyre and vehicle dynamics</i> (2Rev e. ed.). Oxford: Butterworth-Heinemann.	☐
Further	Smith, C. (1978). Tune to win. Fallbrook, Calif.: Aero.	☐
Further	SAE Mobilus (SAE Journal Papers)	☒

Module Code	ACHA4005
Title	Academic Skills
Date	14/05/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To enable students to communicate effectively in a written form when describing concepts or constructing arguments
- To enable students to use a range of suitable academic to help them present information and data.

LEARNING OUTCOMES

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

- Write clearly and effectively when describing ideas and concepts relevant to their field and consulting and reference appropriate resources to support their analysis or findings.
- Use a range of suitable academic tools (theoretical, computational or practical) to help solve problems and communicate the results in a professional manner.

INDICATIVE CONTENT

- The learning process and the skills required to develop an understanding of a concept or principle.
- Gathering information, planning and researching a topic
- Strategies for taking notes, writing essays and reports
- Understanding the elements of non-verbal communication, constructing and documenting arguments
- Developing confidence in tackling communication tasks and being able to debate effectively
- The importance of referencing and the standard referencing systems
- Apply professional skills learned to area of study
- Developing knowledge of suitable computational software that can help with academic work, such as Microsoft Word and Microsoft Excel
- Gaining relevant additional skills specific to programme stream.

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	1500 words	50%

Assessment Component 2

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	1500 words	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACHA4005	
Module Title	Academic Skills	
Classification	Reading List entry	Electronic*
Essential	Osmond, A (2015) Academic Writing and Grammar for Students 2 nd Edition, Palgrave Macmillan	☐
Essential	Pears, R, Sheilds, G (2019) Cite Them Right: The Essential Referencing Guide, Palgrave Macmillan	☒
Essential	UWTSD Library Referencing Handbooks, available at: https://www.uwt.ac.uk/library/student-essentials/referencing-handbooks/	☒
Further	Cottrell, S (2019) The Study Skills Handbook, SAGE Publications Ltd	☒
Further	Gillett, A (2009) Inside Track to Successful Academic Writing, Longman	☐
Further	Greetham, B (2013) How to Write Better Essays, Palgrave Macmillan	☐

	Cottrell, S (2011) Critical Thinking Skills: Developing Effective Analysis and Argument, Palgrave Macmillan	☐
--	---	--------------------------

Module Code	ACHA4006
Title	Further Mathematics
Date	14/05/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with a sound understanding of mathematical principles and the application of these principles to concepts in engineering.

LEARNING OUTCOMES

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

- Demonstrate understanding in aspects of mathematical principles to a level that underpins the knowledge required for further study at a higher level; and
- Use mathematics as an instrument for the solution of basic engineering problems.

INDICATIVE CONTENT

- Differential Calculus
- The concept of calculus and the gradient at a point on curve
- Differentiation of basic functions
- Integral Calculus
- Integration of functions and the relationship with differential calculus
- Standard integrals
- Logarithms
- Solution of any triangle and angles of any magnitude (Sine/Cosine rule)
- Basic trigonometric identities
- Solution of basic trigonometric equations

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 Exam	2 hours	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACHA4006	
Module Title	Further Mathematics	
Classification	Reading List entry	Electronic*
Essential	Smedley, R., Wiseman, G., Introducing Pure Mathematics (Oxford, 2001)	☐
Essential	Davies, H; Hicks, A, Mathematics for Scientific and Technical Students (1998)	☐
Essential	Stroud, K.A. - <i>Engineering Mathematics</i> , (Palgrave Macmillan, 2013)	☒
Further	Bird, J. O. and Ross, C. (2012) Mechanical Engineering Principles, Routledge	☐
Further	Bird, J, (2006) Higher Engineering Mathematics, Newnes	☐

Module Code	ACHA4007
Title	Further Science for Engineering
Date	14/05/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To provide an introduction to the fundamental principles of solid mechanics, fluid mechanics and thermal energy.

LEARNING OUTCOMES

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

- Identify and apply appropriate physical principles and relationships in the solution of engineering problems;
- Manipulate equations to produce numerical values in engineering units.

INDICATIVE CONTENT

- Mechanics of materials - types and basic structures of materials. Direct stress and strain. Elasticity. Shear stress and strain. Miscellaneous simple problems, including factor of safety.
- Equations of linear motion
- Angular velocity and equations of motion
- Motion and friction - displacement, velocity and uniform acceleration. Newton's laws of motion. Torque and angular motion and acceleration. I values ($T = I\alpha$). Work, energy and power, including effects of friction. Basic vibrations - simple harmonic motion (spring - mass systems).
- Thermal energy - temperature scales. Phases and states. Vapours and gases. Specific heats and latent heats. Gases. Boyle's law, Charles' Law and Combined Gas Law $pV/T = c$ and $pV = mRT$.
- Fluids - concepts of viscosity. Hydrostatics - pressures in liquids. volumetric flow calculations and principles of continuity.

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 Report	1200 words	30%

Assessment Component 2

(Tick one)

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Exam	1.5 hours	70%

Assessment Summary

Activity type	Percentage
Written exam	70%
Coursework	30%
Practical	0%
TOTAL	100%

INDICATIVE READING LIST

Module Code	ACHA4007	
Module Title	Further Science for Engineering	
Classification	Reading List entry	Electronic*
Essential	Bolton, W. (2007) Engineering Science, Arnold	☐
Essential	McDonagh, I. and Waterworth, G. (2015) Engineering Science Volumes 1 and 2, Arnold	☒
Essential	McDonagh, I., Mechanical Science for Technicians Volume 1, Arnold	☐
Further	Bird, J. (2012) Science for Engineering, Routledge	☐
Further	Bird, J. O. and Ross, C. (2012) Mechanical Engineering Principles, Routledge	☐

Module Code	ACHA4008
Title	Integrating Project
Date	14/05/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To enable students to apply the knowledge they have gained through the modules they have studied, in the development of project. The product of the project will take the form of a subject related application which may be a software application, electronics application, design, etc.

LEARNING OUTCOMES

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

- To implement an application/design synthesizing their knowledge from a number of modules
- To analyse a well-defined scenario, establish the requirements and develop an appropriate solution

INDICATIVE CONTENT

- Overview of research and development methodologies suitable for student projects.
- Ethical issues
- Sustainability issues
- Contingency planning
- Development of documentation for academic projects
- Presentation of work produced to an academic audience
- Subject-specific content as required

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 assessment	2000 words	60%

Assessment Component 2

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Presentation or Demonstration	Approx 10 minutes	40%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	60%
Practical	40%
TOTAL	100%

INDICATIVE READING LIST

Module Code	ACHA4008	
Module Title	Integrating Project	
Classification	Reading List entry	Electronic*
Essential	Larson, E.W. (2017) 7th Edition, Project Management. McGraw-Hill	☒
Further	Newton, R. (2016), Project Management Step by Step, FT Publishing International	☒
Further	Hughes, B. (2015), 5th Edition Project Management for IT-Related Projects, British Computer Society	☒
Further	Christopher, D (2013) Computing Projects, Pearson Education	☐
Further	Berndtsson, T (2012) Planning and Implementing your Project, Springer Verlag	☐
Further	Cottrell, S.(2011) Critical Thinking Skills: Developing Effective Analysis and Argument, Palgrave Macmillan	☐
Further	Collis, J., Hussey, R (2009) Business Research: a Practical Guide for Undergraduate and Postgraduate Students, Palgrave Macmillan	☐

Module Code	ACHA4009
Title	Introduction to Automotive Engineering
Date	14/05/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To introduce students to the varied disciplines in the field of Automotive, Motorsport and Motorcycle Engineering
- To introduce CAD software and its applications to the automotive and motorsport sector

LEARNING OUTCOMES

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

- Show an appreciation for the varied disciplines required in the field of Automotive Engineering and associated pathways and to prove an understanding of the current state of the Automotive Industry and the requirements for more sustainable developments and advances in the field.
- Show a basic understanding of Computer Aided Design and be able to produce models and technical drawings using a piece of CAD Software.

INDICATIVE CONTENT

- Introduction to the Automotive, Motorsport and Motorcycle Sectors.
- Introduction to CAD software
- Challenges and legislative drivers for development in the industry
- Introduction to Engine Performance and Efficiency
- Introduction to Vehicle Handling and Dynamics
- Introduction to Data Acquisition and the importance of Metrology
- Introductory Aerodynamics & CFD
- Introductory CAE and Simulation
- Competitive Motorsport and the Automotive Industry.
- Sustainability, Green Technologies and Vehicle Life Cycles

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
CAD Assignment	2000 words	50%

Assessment Component 2

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written report	2000 words	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACHA4009	
Module Title	Introduction to Automotive Engineering	
Classification	Reading List entry	Electronic*
Essential	Cocco, G.(2005) Motorcycle Design and Technology, Giorgio NADA Editore	☐
Essential	Foale, T. (2002) Motorcycle Handling and Chassis Design, Tony Foale	☐
Essential	Hillier, V., and Coombes, P. (2004) Fundamentals of Motor Vehicle Technology, Stanley Thornes	☐
Essential	Lombard, M (2013) SolidWorks 2013 Bible, Wiley	☐
Further	Staniforth, A. (2006) Competition Car Suspension: A Practical Handbook, Haynes	☐
Further	Stone, R. (1999), Introduction to Internal Combustion Engines, Macmillan	☐

Further	Bolton, W. (2007) Engineering Science, Arnold	☐
Further	Leithman, S.(2009) Build Your Own Plug-In Hybrid Vehicle, McGraw Hill	☐
Further	Onwubolu, G.(2013) Computer-aided engineering design with SolidWorks	☐
Further	Society of Automotive Engineering, (2019) Journal of Automotive Engineering, SAE	☒

Module Code	ACHA4010
Title	Electrical Control Systems
Date	17/09/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with background knowledge and understanding of vehicle electrical and electronic systems, circuits and components.
- To develop their ability to test these systems whilst using computers as an aid for solving problems.

LEARNING OUTCOMES

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

- Investigate technical applications and solutions for engine electrical and electronic circuits
- Analyse the solutions and operations of sensors, actuators and displays with the aid of computers

INDICATIVE CONTENT

- Electrical principles
- Vehicle electrical and electronic circuits
- Principles of electromagnetism
- Sensors, actuators and displays analysis and technical evaluation
- Technical applications of engine control systems
- Dedicated computer and scope functions and analysis
- ABS & Traction Control

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Report	4000 words	100%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, SM3b, EA1b, EA4b, P3

INDICATIVE READING LIST

Module Code	ACHA4010	
Module Title	Electrical Control Systems	
Classification	Reading List entry	Electronic*
Essential	Bosch - <i>Bosch Automotive Handbook</i> 10 th Edition, (Bosch, 2018)	☐
Essential	Hillier V – <i>Fundamentals of Automotive Electronics</i> , 6 th Edition, (Nelson Thornes, 2012)	☒
Essential	Bosch, <i>Automotive Electrics and Electronics</i> 5 th Edition, (Bosch, 2007)	☐
Further	Heinz H - Advanced Engine Technology, (Edward Arnold, 1995) Denton T - Electrical and Electronics Systems 3rd Edition, (Elsevier Ltd, 2004)	☐
Further	Plint M - Engine Testing 3rd Edition, (Butterworth–Heinemann, 1995)	☐
Further	Bird J - Electrical and Electronic Principles and Technology, (Newnes, 2007)	☐
Further	Heizer, H., Advanced Engine Technology (Butterworth Heinemann, 1995)	☐
Further	Websites www.sciencedirect.com http://www.tjprc.org/journals/international-journal-of-automobile-engineering-research-and-development223 http://www.academia.edu/Documents/in/Automobile_Engineering https://www.scimagojr.com/journalrank.php?category=2203 https://journals.sagepub.com/home/pid	☒
Further	SAE Journals	☒
Further	IMechE Journal	☒

Module Code	ACHA4011
Title	Workshop & Practice
Date	17/09/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To introduce the student to workshop and laboratory skills alongside safety practices through the media of degree pathway specific technology whilst allowing them to critically evaluate and apply theoretical technical concepts to specific applications and problem-solving exercises.
- Accelerate their learning process and strategies. The students will be encouraged to develop a reflective, active, positive approach to learning, and to take responsibility for their own learning. Such skills promote a deeper learning approach and understanding of the topics studied throughout the programme; they support lifelong learning, and are the transferable skills desired in the employment context.

LEARNING OUTCOMES

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

- demonstrate knowledge and understanding of specific technical concepts and how their theoretical characteristics are used in discipline specific technical applications;
- apply practical technical skills and demonstrate know-how of practices, skills, safety and standards with respect to laboratory and workshops, and key transferable skills in terms of written and oral presentation, personal development, reflective abilities and proficiency in appropriate technical software

INDICATIVE CONTENT

- An awareness of and practice in, the use of equipment for the measurement of fundamental quantities.
- Familiarity with basic stream relevant components, laboratory and workshop equipment and their real-world applications and behaviour.
- Health & Safety procedures and legislations, personal protective equipment and safe working practice.
- Understanding the learning process and identifying skills (eg self-evaluation, skills needed for higher education, transferable skills, action plans for personal development).
- Organising study (e.g. time management, organising space, organising resources)
- Structuring study and sourcing information - effective note taking, using the library and the internet, referencing convention. Revision and examination techniques.

- Communicating and presenting information (e.g. presentation techniques, styles, the appropriate use of graphs, charts, measures of central tendency)
- Developing an appropriate writing style (eg planning and structuring essays and reports, linking ideas together, using facts, opinions or arguments, analytical thinking etc.)
- Develop proficiency of appropriate general and technical specific software (Microsoft Word, Excel, PowerPoint etc.)

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
Logbook / Portfolio based on practical and laboratory sessions.	2000 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Coursework	2000 words	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met;
EA4b, D2, D6, EL1, EL5, EL6, P2, P3, P4, P6, P11b, G1, G2, G4

INDICATIVE READING LIST

Module Code	ACHA4011	
Module Title	Workshop & Practice	
Classification	Reading List entry	Electronic*
Essential	Bosch Automotive Handbook (Bentley, 2011)	☐
Essential	Cottrell, S., The Study Skills Handbook (Palgrave Macmillan, 2013)	☒
Essential	Van Emden, J., Writing for Engineers (Palgrave Macmillan, 2005)	☒
Essential	Bird, J., Mechanical Engineering Principles (Newnes, 2002)	☐
Essential	Shigley, J., Mechanical Engineering Design - 9th Edition (McGraw Hill, 2011)	☐
Further	Bolton, W., Mechanical Science, Wiley-Blackwell (2006)	☐
Further	Hannah, J. and Hillier, M. J., Mechanical Engineering Science (Prentice Hall, 1999)	☐
Further	Health and Safety Executive www.hse.gov.uk	☒

Module Code	ACHA4012
Title	Motorsport Technology
Date	17/09/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To allow the student to acquire knowledge of a range of motorsport powertrain, suspension, control and chassis systems through lectures and practical investigations

LEARNING OUTCOMES

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

- Show a detailed knowledge and understanding of the underlying principles of engine and vehicle technologies and practices for analysis of powertrain and chassis systems in a motorsport application
- demonstrate subject specific practical and cognitive skills applied to a motorsport application problem, obtaining and interpreting data in a laboratory environment and drawing relevant conclusions

INDICATIVE CONTENT

- Tyre construction and performance
- Tyre slip angles
- Car suspension systems design parameters, geometries and performance characteristics
- Vehicle suspension as a kinematic system
- Load transfer under longitudinal and lateral acceleration
- Steering & Braking systems
- Basic aerodynamic principles
- Engine design features
- Engine types and operation
- Cylinder head flow characteristics
- Dynamometer testing
- Measurement of car suspension systems
- Transmission specification using numerical techniques

- Chassis design features
- Chassis construction techniques
- Manufacturing techniques

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written technical report	2000 words	50%

Assessment Component 2

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Practical work	2 Hours Laboratory Based Assessment	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, P1, P3

INDICATIVE READING LIST

Module Code	ACHA4012	
Module Title	Motorsport Technology	
Classification	Reading List entry	Electronic*
Essential	Stone, R., Introduction to Internal Combustion Engines (Macmillan, 1999)	☐
Essential	Hillier, V., and Coombes, P., Fundamentals of Motor Vehicle Technology (Stanley Thornes, 2004)	☐
Essential	Schüetz, T. (2016). Aerodynamics of road vehicles (Fifth ed.).	☐
Further	Katz, Joseph. Race Car Aerodynamics: Designing for Speed. Cambridge, Mass.: Robert Bentley, 1995. Print.	☐
Further	Heywood, J., Internal Combustion Engine Fundamentals (McGraw Hill, 1989)	☐
Further	Pacejka, H. (2006). <i>Tyre and vehicle dynamics</i> (2Rev e. ed.). Oxford: Butterworth-Heinemann.	☐
Further	Rowley, W., An Introduction to Race Car Engineering - 3 rd Edition (Rowley Race Dynamics, 2005)	☐
Further	Smith, C. (1978). Tune to win. Fallbrook, Calif.: Aero.	☐
Further	Staniforth, A., Competition Car Suspension: A Practical Handbook (Haynes, 2006)	☐
Further	SAE Mobilus (SAE Journal Papers)	☒

Module Code	ACMA4000
Title	Materials and Introduction to Processing
Date	01/02/2021
Level	4
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
*SM3b	Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline
EL4	Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate
P2	Knowledge of characteristics of particular materials, equipment, processes or products

*Only applies to Mechanical Engineering & Energy and Environmental Engineering programmes.

AIM(S)

- To develop a knowledge base and understanding of the structure, properties and basic selection of all classes of materials
- To develop a knowledge and appreciation of the processes used in the manufacture of components with a view to providing basic process selection parameters using a broad range of industrial applications to illustrate this

LEARNING OUTCOMES

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

- an understanding of the structure and properties of metals and polymers
- Knowledge of the applications, advantages and limitations of different manufacturing processes and understanding of engineering materials and manufacturing process selection

INDICATIVE CONTENT

- Materials and the environment: corrosion, UV degradation,
- Polymeric processing (Mould design, process parameters and defects)
- Solidification, metals and alloys, polymers and co-polymerisation, glass transition temperature in polymers
- Primary processing, iron and steelmaking, polymer processing, aluminium processing
- Metallic Casting processes, Sand Casting, Gravity Die Casting, Pressure Die Casting, Investment Casting etc
- Introduction to manufacturing processes: casting, moulding, forming, machining, joining, rapid manufacturing and 3D printing.
- Forming processes. Such as Forging (Smith, Drop, Press, Upset), Rolling, Extrusion, Deep Drawing and sheet metal processing
- Secondary processing - machining and cutting (tool/material wear). Forces and energy dissipation: coatings (electro-plating, thermal spraying, powder coating and cladding)
- Thermal equilibrium diagrams. Ferrous and non-ferrous alloys, Heat treatment, Strengthening Mechanisms, work hardening, structure alignment, precipitation hardening, surface and bulk hardening mechanisms

- Joining - Welding processes, joint design, welding procedures and typical defects

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
Report with presentation	Technical or Laboratory Report 1500 words and Presentation 15 mins	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4000	
Module Title	Materials and Introduction to Manufacturing Technology	
Classification	Reading List entry	Electronic*
Essential	Groover, M. P., Principles of Modern Manufacturing - 6 th Edition (Wiley, 2017)	☐
Essential	Callister, W. D.; Rethwisch, D. G., Materials Science and Engineering - 9 th Edition (Wiley, 2014)	☒
Essential	Bolton, W Engineering Science 6 th Edition 2015	☒
Further	Ashby, M. and Johnson, K., (2010) Materials and Design: The Art and Science of Materials Selection in Product Design - 2 nd Edition (Butterworth-Heinemann, 2010)	☐
Further	Ashby, M. and Jones, D., Engineering Materials: An Introduction to Properties, Applications and Design - 4 th Edition (Butterworth Heinemann, 2011)	☐
Further	Chiles, V., Black, S. and Lissaman, A., Principles of Engineering Manufacture - 3 rd Edition (Elsevier, 1996)	☐
Further	Beddoes, J., Principles of Metal Manufacturing Processes (Elsevier Butterworth Heinemann, 1999)	☐
Further	Journal of Manufacturing Processes, the Society of Manufacturing Engineers (SME)	☐

Module Code	ACMA4001
Title	Physical Science for Materials
Date	01/02/2021
Level	4
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
SM3b	Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline
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)
P2	Knowledge of characteristics of particular materials, equipment, processes or products

AIM(S)

- To develop an understanding of the physics of solids, the importance of chemical reactivity in materials processing and behaviour and the fundamental laws of thermodynamics, heat transfer and fluid flow

LEARNING OUTCOMES

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

- Develop an understanding of the fundamental atomic structure of materials and their consequent physical and chemical properties with an appreciation of basic chemical reactions that are important in the extraction, preparation and behaviour of materials
- Develop an understanding of the fundamental laws of thermodynamics, heat transfer and fluid flow and typical applications in materials engineering

INDICATIVE CONTENT

- Atomic Structure: Atomic structure, atomic numbers and weights, electronic structure of atom. Atomic theory of the elements
- The principles of inter-atomic bonding and the various types of material properties (e.g. mechanical, thermal and electrical properties) which may result
- Thermal properties of materials; heat capacity and thermal conductivity
- The theory of electrical conduction is then introduced, initially from a 'classical' point of view (Drude model) and then progressing to the modern band theory
- Electrons at interfaces; i) surfaces of metals and semiconductors and ii) junctions between different types of semiconductor (p-n junctions)
- Optical properties of materials
- Redox and acid base reactions. Means of quantifying chemical processes
- Chemical thermodynamics controlling reactivity
- Equilibrium and the importance of reactive kinetics
- Laws of thermodynamics. Principles of heat transfer
- Principles of hydrostatics and basic fluid flow.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Report	2,000 words	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4001	
Module Title	Physical Science for Materials	
Classification	Reading List entry	Electronic*
Essential	White, M.A., Physical Properties of Materials (CRC Press, 2018)	☒
Essential	Cengel, Y., Boles, M., Thermodynamic: An Engineering Approach, 9 th Edition (McGraw-Hill Education, 2018)	☐
Essential	Callister, W. D., Rethwisch, D. G., Materials Science and Engineering, 9 th Edition (John Wiley & Sons, 2014)	☐
Further	Fisher, T., Materials Science for Engineering Students (Academic Press, 2008)	☒
Further	DeHoff, R., Thermodynamics in Materials Science (CRC Press, 2006)	☒
Further	Ashby, M. and Johnson, K., Materials and Design: The Art and Science of Materials Selection in Product Design (Butterworth-Heinemann, 2002)	☐
Further	Schrader, G. F. and Elshennawy, A. K., Manufacturing Processes and Materials (Society of Manufacturing Engineers, 2000)	☐
Further	Creese, R. C., Introduction to Manufacturing Processes and Materials (Manel Dekker, 1999)	☐
Further	Ashby, M. and Jones, D. R. H., Engineering Materials: An Introduction to Microstructure, Processing and Design (Butterworth-Heinemann, 1998)	☐

Module Code	ACMA4002
Title	Plant Operations and Performance
Date	01/02/2021
Level	4
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
EL4	Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate
EL6	Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques
P2	Knowledge of characteristics of particular materials, equipment, processes or products
P5	Knowledge of relevant legal and contractual issues
P6	Understanding of appropriate codes of practice and industry standards

AIM(S)

- To provide the student with the understanding to be able to install, commission and monitor equipment performance

LEARNING OUTCOMES

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

- Understand how to undertake commissioning and installation activities to ensure business and operational needs are fulfilled.
- Monitor equipment performance using a range of techniques and understand performance requirements of the plant.

INDICATIVE CONTENT

- Specifications for equipment including development and criteria for installation and commissioning.
- Installation of equipment including planning the project, provision of utilities, environmental issues, health and safety, ergonomics and resources
- Commissioning – understand what it involves and be able to put a proposal forward for commission plant
- Monitoring equipment in terms of reliability, energy performance and operational factors
- Measuring performance of equipment in terms of productivity, downtime, and energy consumption

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

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

Assessment Component 2

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Poster presentation and marking of poster	20 minutes	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4002	
Module Title	Plant Operations and Performance	
Classification	Reading List entry	Electronic*
Essential	Kilcross, M (2018) Chemical and Process Plant Commissioning Handbook, Butterworth-Heinemann	☐
Essential	Moran, S (2015) An Applied Guide to Process and Plant Design, Elsevier, Oxford	☒
Essential	Harris, D (2016) A Guide to Energy Management in Buildings, 2 nd Edition, Routledge, Abingdon	☒
Further	Beggs, C (2009) Energy Management, Supply and Conservation, 2 nd Edition, Routledge, Abingdon	☐
Further	Mobley, R. Keith (2014) Maintenance Engineering Handbook 8 th Edition, McGraw Hill, New York	☐
Further	Thorpe, D (2014) Energy Management in Industry, Earthscan, Abingdon	☐
Further	Oung, K (2013) Energy Management in Business: The Manager's Guide to Maximising and Sustaining Energy Reduction, Abingdon	☐

Module Code	ACMA4003
Title	Project Design
Date	01/02/2021
Level	4
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
EA4b	Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering objectives
D1	Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics
D2	Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards
D5	Plan and manage the design process, including cost drivers, and evaluate outcomes
EL3b	Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering objectives
P6	Understanding of appropriate codes of practice and industry standards
P11b	Understanding of, and the ability to work in, different roles within an engineering team

AIM(S)

- To equip the student with the knowledge necessary to effectively participate in operational/industrial projects

LEARNING OUTCOMES

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

- Demonstrate awareness of project design concepts and principles showing how they can be deployed in industry
- Demonstrate the use of design tools and techniques to define projects and make sound judgements in the context of industrial engineering projects

INDICATIVE CONTENT

- Project phases- initiation, planning, execution, monitoring and control, and closure phases
- Project management- time management, resource planning, construction of network diagrams and Gantt charts, data security, quality control
- Team working and group dynamics – leadership styles, Belbin roles in a team, Tuckman's team building phases, managing people
- System engineering- levels of systems engineering, system boundaries, system design methods, validation and verification
- Research techniques- surveys and questionnaires, on-line databases, private communications, collecting data.

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
Report	2000 words	50%

Assessment Component 2

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Presentation	15 minutes	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4003	
Module Title	Project Design	
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	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	ACMA4004
Title	Quality and Business Improvement
Date	01/02/2021
Level	4
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
P1	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc)
P2	Knowledge of characteristics of particular materials, equipment, processes or products
P7	Awareness of quality issues and their application to continuous improvement

AIM(S)

- To provide the student with the ability to use a range of tools and techniques to improve quality of products and services and business performance.

LEARNING OUTCOMES

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

- Apply a range of tools and techniques that can be used to investigate problems, assess risk, and analyse areas for improvement
- Understand the main elements of the six sigma methodology

INDICATIVE CONTENT

- Main elements of six sigma, DMAIC methodology,
- Lean principles for process improvement
- Failure modes effects analysis- process, systems service FMEAs, benefits and continuous improvements
- Quality Function Deployment analysis
- Kano model for quality
- Seven basic quality tools- Pareto Analysis, cause and effects analysis, check sheets, control charts, flow charts, histograms and scatter diagrams
- Error proofing- applications, use of Poka-Yoke techniques and different levels of error proofing

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
Report	2000 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	2000 words	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4004	
Module Title	Quality and Business Improvement	
Classification	Reading List entry	Electronic*
Essential	Dale, B; Van der Wiele, T and Van Iwaarden, J (2016) Managing Quality, Blackwell Publishing	☒
Essential	Jones, E (2017) Quality Management for Organisations Using Lean Six Sigma Techniques, CRC Press, Boca Raton	☐
Essential	Summers, D (2010) Lean Six Sigma Process Improvement Tools and Techniques, Pearson, New Jersey	☐
Further	Besterfield, D (2012) Quality Improvement, 9 th Edition, Pearson Education Limited Harlow	☒

Further	Brook, Q (2017) Lean Six Sigma and Minitab The Complete Toolbox Guide for Business Improvement, 5 th Edition, Opex Resources Ltd	☐
Further	Gitlow, H; Oppenheim, A; Oppenheim, R and Levine, D (2005) Quality Management, 3 rd Edition, McGraw Hill, New York	☐
Further	Altman, H (2017) Six Sigma: Quick Step-by-Step Guide to Improve Quality and Eliminate Defects in any process, Create Space Independent Publishing Platform	☐
Further	Backstrom T., Fundin A. and Johansson P.E., (2019), Innovative Quality Improvements in Operations: Introducing Emergent Quality Management (International Series in Operations Research & Management Science), Springer	☒
Further	George M, Blackwell D. and Rajan D., (2019), Lean Six Sigma in the Age of Artificial Intelligence: Harnessing the Power of the Fourth Industrial Revolution, McGraw-Hill Education	☒

Module Code	ACMA4005
Title	Manufacturing and Materials
Date	14/05/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To enable the student to understand current manufacturing and design technologies including CAD, materials selection, manufacturing processes and rapid prototyping.

LEARNING OUTCOMES

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

- Select suitable manufacturing technologies for real parts.
- Demonstrate an understanding of material properties and selection.

INDICATIVE CONTENT

- CAD fundamentals.
- Introduction to material properties and selection.
- Introduction to manufacturing processes and selection.
- Introduction to engineering design principles.

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 report	1500 words	50%

Assessment Component 2

(Tick one)

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written report	1500 words	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4005	
Module Title	Manufacturing and Materials	
Classification	Reading List entry	Electronic*
Essential	Kalpajian, S. and Schmid, S. (2015) Manufacturing Processes for Engineering Materials (5 th Edition)	☒
Essential	Edwards, L. and Endean, M.(1990) Manufacturing with Materials, Butterworth Heinemann	☐
Essential	Pao, Y. C. (1984) Elements of Computer-aided Design and Manufacturing: CAD/CAM, Wiley	☐
Further	Bird, J. O. and Ross, C.(2012) Mechanical Engineering Principles, Routledge	☐
Further	Haigh, M. (1985) An Introduction to Computer-Aided Design and Manufacture, Blackwell Scientific.	☐

Module Code	ACMA4006
Title	Engineering Mathematics
Date	01/02/2021
Level	4
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

AIM(S)

- To introduce the student to the mathematical ideas and techniques necessary for an understanding of the mathematics encountered in further engineering modules

LEARNING OUTCOMES

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

- demonstrate understanding and competency with respect to a range of algebra and functions mathematical techniques which are the basis of the mathematics required in engineering; calculus, types of integrals, manipulation of matrices and complex number theory, cartesian and polar form and manipulation of complex numbers

INDICATIVE CONTENT

- Solution of linear, quadratic and simultaneous equations
- Transposition of formula
- Solution of indicial and logarithmic equations using the laws of logarithms
- Trigonometry, Sine and Cosine rule, solution of trigonometric equations
- Logarithms and their use in solution of indicial and logarithmic equations
- Statistical methods including standard deviation, averages, sample distribution, standard error, sample variance.
- Differential calculus: standard rules; simple partial differentiation
- Integral calculus: definite and indefinite integrals; standard integrals; integration by parts; integration by substitution;
- Complex numbers: algebra and manipulation; Argand diagram; polar form; De Moivre's theorem
- Differentiation: maxima, minima and points of inflection; standard derivatives and the rules of differentiation;
- Matrix algebra: manipulation of matrices, determinants, solution of simultaneous equations using Cramer's method

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	1.5 hours	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	1.5 hours	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4006	
Module Title	Engineering Mathematics	
Classification	Reading List entry	Electronic
Essential	Smedley, R., Wiseman, G., Introducing Pure Mathematics (Oxford, 2001)	☐
Essential	Stroud, K. A., Engineering Mathematics (Red Globe Press, 2020)	☐
Further	Singh, K., Engineering Mathematics through Applications (Red Globe Press, 2011)	☐
Further	Rouvel, J., Automotive Mathematics (Pearson/Prentice Hall, 2005)	☐
Reference	https://www.khanacademy.org/	☒

Module Code	ACMA4007
Title	Engineering Applications and Study Skills
Date	01/02/2021
Level	4
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
EA3b	Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action
D6	Communicate their work to technical and non-technical audiences
EL5	Awareness of the relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues
P3	Ability to apply relevant practical and laboratory skills
P8	Ability to work with technical uncertainty
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

AIM(S)

- To introduce the student to workshop and laboratory skills and safety practices through the media of degree pathway specific technology whilst allowing them to critically evaluate and apply theoretical engineering concepts to specific applications and problem-solving exercises.
- Accelerate their learning process and strategies.

LEARNING OUTCOMES

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

- demonstrate knowledge and understanding of specific engineering concepts and how their theoretical characteristics are used in discipline specific engineering applications;
- apply practical engineering skills and demonstrate know-how of practices, skills, safety and standards with respect to laboratory and workshops, and key transferable skills in terms of written and oral presentation, personal development, reflective abilities and proficiency in appropriate engineering software
- Demonstrate key transferable skills in the creation of a personal development plan, manage their own learning; avoid plagiarism and create independent work; master referencing conventions; communicate information, ideas, problem and solutions to both specialist and non-specialist audiences; apply a range of key transferable study and communication skills to produce assignment work.

INDICATIVE CONTENT

- Understanding the learning process and identifying skills (e.g. self-evaluation, skills needed for higher education, transferable skills, action plans for personal development).
- Organising study (e.g. time management, organising space, organising resources)

- Structuring study and sourcing information - effective note taking, using the library and the internet, referencing convention. Revision and examination techniques.
- Communicating and presenting information (e.g. presentation techniques, styles, the appropriate use of graphs, charts, measures of central tendency)
- Developing an appropriate writing style (e.g. planning and structuring essays and reports, linking ideas together, using facts, opinions or arguments, analytical thinking, etc.)
- Fundamentals of Statistics and Probability.
- Fundamentals of computing language.
- Develop proficiency of appropriate general and engineering specific software.
- Implementation of Matlab to solve statistics practice problems.
- Familiarity with basic electronic and mechanical components, laboratory and workshop equipment and their real-world applications and behaviour.
- Health & Safety procedures and legislations, personal protective equipment and safe working practice.
- Workshop / machine-shop practical exercises

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
Series of short exercises, reports and presentations	1,600 words total	40%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report & Logbook documenting engineering applications covered.	2,400 words	60%

Assessment Summary

Activity type	Percentage
Written exam	0%
Coursework	60%
Practical	40%
TOTAL	100%

INDICATIVE READING LIST

Module Code	ACMA4007	
Module Title	Engineering Applications and Study Skills	
Classification	Reading List entry	Electronic*
Essential	Bosch Automotive Handbook (Bentley, 2011)	☐
Essential	Cottrell, S., The Study Skills Handbook (Red Glob Press, 2019)	☒
Essential	Van Emden, J., Writing for Engineers (Red Globe Press, 2017)	☒
Essential	Bird, J., Mechanical Engineering Principles (Routledge, 2019)	☐
Essential	Shigley, J., Mechanical Engineering Design - 10th Edition (McGraw Hill, 2014)	☐
Further	Bolton, W., Mechanical Science, Wiley-Blackwell (2006)	☐
Further	Hannah, J. and Hillier, M. J., Mechanical Engineering Science (Prentice Hall, 1999)	☐
Further	Sizemore, J., MATLAB for dummies (John Wiley & Sons, 2015)	☒
Further	Health and Safety Executive www.hse.gov.uk	☒

Module Code	ACMA4008
Title	Engineering Design
Date	01/02/2021
Level	4
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
*SM3b	Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline
D1	Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics
D2	Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards
D5	Plan and manage the design process, including cost drivers, and evaluate outcomes
P3	Ability to apply relevant practical and laboratory skills

* Only applies to Materials Science programme

AIM(S)

- To introduce students to both 2D and 3D Computer Aided Design, Drafting and Solid Modelling and a familiarity with the engineering design process and to give an understanding of the theory and application of design methodologies and processes.
- To develop a knowledge base and understanding of the structure, properties and basic selection of classes of materials and appreciation of the processes used in the manufacture of components with a view to providing basic process selection parameters

LEARNING OUTCOMES

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

- Show knowledge and understanding of design methodologies and processes (problem definition/decision making/communication etc.) Including key transferable skills in problem formulation and decision making, communication and self-management skills
- Demonstrate skills in communicating the design, material and manufacturing of products through the preparation and interpretation of Engineering Drawings to BS8888 through the medium of 2D and 3D CAD tools. Including cognitive skills to allow choice of material and manufacturing processes to meet specific design criteria.

INDICATIVE CONTENT

- Methodologies for the generation of design solutions to conceptual and adaptive design problems, to include creativity, innovation, evaluation, optimisation, design isolation, manufacture, reliability, sustainability, safety and cost implications.
- Engineering Graphics – basic sketching and drawing skills in the creation and interpretation of engineering drawings. British Standard 8888 (or equivalent standard).
- Computer Aided Drawing – introduction to the use of Solidworks (or equivalent software) for the creation of 3D solid models, assemblies and 2D engineering drawings.

- Methodologies for the generation of design solutions to conceptual and adaptive design problems. To include; creativity, innovation, evaluation, optimisation, design isolation, manufacture, reliability, sustainability, safety and cost implications.
- Material properties and material selection using CES material selection software.
- Introduction to primary and secondary manufacturing processes.
- Tolerancing principles, limit and fit calculations, geometric dimensioning and tolerancing theory and applications

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Practical Assessment	2 Hour Assessment	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Technical Report	2000-word report	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4008	
Module Title	Engineering Design	
Classification	Reading List entry	Electronic*
Essential	Pugh S - Total Design: Integrated Methods for Successful Product Engineering, (Prentice Hall, 1990)	☐
Essential	Madsen, D., Engineering Drawing and Design (Cengage Delmar Learning, 2016)	☒
Essential	Pahl, G. et al - Engineering Design: A Systematic Approach, (Springer, 2006)	☐
Further	Willis, J., SolidWorks 2020: A Power Guide for Beginners and Intermediate User, (CADArtifex, 2020)	☒
Further	Ullman DG - The Mechanical Design Process, 6 th Edition, (David Ullman LLC, 2017)	☒
Further	Ashby, M., Materials Selection in Mechanical Design, 5 th Edition, (Butterworth-Heinemann, 2016)	☒
Further	Walker, S., Sustainable by Design: Explorations in Theory and Practice, (Routledge, 2006)	☐
Further	Budynas, R., Shigley's Mechanical Engineering Design (McGraw-Hill Education, 2014)	☐
Further	Science Direct (https://www.sciencedirect.com/)	☒

Module Code	ACMA4009
Title	Applied Analytics
Date	24/02/2021
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To provide students with a sound understanding of mathematical, scientific and technological principles.

LEARNING OUTCOMES

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

- Apply a range of analytical principles and understand how they can be used to solve technical problems.

INDICATIVE CONTENT

- Solution of linear and quadratic equations
- Solution of simultaneous equations
- Transposition of formula
- Introduction to trigonometry and right-angled triangles (SOHCAHTOA)
- Units - basic SI units of length, mass and time, area and volume, density and relative density, mass and weight, force, work and power.
- Newton's laws of motion
- Equations of linear motion
- Forces and moments - conditions of static equilibrium, forces and reaction, especially simply supported beams. Moments of a form. Resultant, couples, center of gravity. Vector rotation. Resolution of forces. Polygon of forces.
- Introduction to Stress and Strain, Young's modulus
- Electrical current/voltage. Mechanical analogies. Resistors in series and parallel. The heating effect of current, variation of resistance with temperature incandescent lamp.
- Voltage divider and current divider. Simple circuit calculations, use of Ohm's law and Kirchhoff's laws

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

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
In class exercise / practical test	1 hour	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4009	
Module Title	Applied Analytics	
Classification	Reading List entry	Electronic*
Essential	Smedley, R., Wiseman, G., Introducing Pure Mathematics (Oxford, 2001)	☐
Essential	Bolton, W. (2007) Engineering Science, Arnold	☐
Essential	Davies, H; Hicks, A, Mathematics for Scientific and Technical Students	☒
Further	Stroud, K A, (2007) Engineering Mathematics, Industrial Press	☐
Further	McDonagh, I. and Waterworth, G. Engineering Science Volumes 1 and 2, Arnold	☐
Further	Bird, J. O. and Ross, C. (2012) Mechanical Engineering Principles, Routledge	☐
Further	Bird, J, (2006) Higher Engineering Mathematics, Newnes	☐
Further	McDonagh, I., Mechanical Science for Technicians Volume 1, Arnold	☐
Further	Hannah, J. and Hillier, M.(1999) Mechanical Engineering Science, Longman	☐
Further	Bird, J. O. and Ross, C.(2012) Mechanical Engineering Principles, Routledge	☐

Module Code	ACMA4010
Title	Automation and Robotics / Industry 4.0
Date	24/02/2021
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To develop students' awareness of automation, robotics and industry 4.0 enabling technologies within engineering contexts.

LEARNING OUTCOMES

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

- Understand the fundamental principles of Industry 4.0 and how the application of associated technologies can be deployed to enhance engineering operations.

INDICATIVE CONTENT

- Classifications of robotic systems
- Classifications of automation systems. This could include pneumatics, hydraulics and electrical control of fluid power systems.
- Awareness of Industry 4.0 technologies and their typical applications. This could include Digital Twin models, Advanced Sensors, Big Data (capture and analysis), Machine Learning and AI, Cloud Computing, Additive Manufacturing and Internet of Things

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

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Practical Exercise with technical report.	Equivalent to 2000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4010	
Module Title	Automation and Robotics / Industry 4.0	
Classification	Reading List entry	Electronic*
Essential	Sergi, B. S. (2019) Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work, Emerald Publishing Limited	☒
Essential	Bornet, P. (2020) Intelligent Automation: Learn how to harness Artificial Intelligence to boost business & make our world more human, Independently published	☒
Further	Blokdyk, G. (2019) Automation Solutions A Complete Guide, 5STARCooks.	☒

Module Code	ACMA4011
Title	Computer Aided Engineering Design
Date	24/02/2021
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To provide students with an introduction to the engineering design process and the fundamentals of Computer Aided Engineering Design software applications.

LEARNING OUTCOMES

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

- Demonstrate application of basic functions within contemporary Computer Aided Design software along with understanding of the role which such software applications play in the engineering design and development cycle.

INDICATIVE CONTENT

- Fundamentals of Engineering Drawing
- Fundamentals of Technical Product Specification
- Fundamentals of Assembly Modelling
- Introduction to Creative Problem Solving
- Introduction to the Engineering Design Process

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

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Lab/software based technical exercise	Equivalent to 2000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4011	
Module Title	Computer Aided Engineering Design	
Classification	Reading List entry	Electronic*
Essential	Haik, Y. and Shahin, T. (2017) Engineering Design Process, CL Engineering	☒
Essential	Simmons, Simmons, C. H. Maguire, et al. (2020) Manual of Engineering Drawing: British and International Standards, Butterworth-Heinemann	☒
Further	Almattar, T. (2020) Learn Solidworks 2020: A hands-on guide to becoming an accomplished SOLIDWORKS Associate and Professional, Packt Publishing	☒

Module Code	ACMA4015
Title	Business Planning
Date	07/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To facilitate students' understanding of business planning and project management.

LEARNING OUTCOMES

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

- assess the internal and external business environment using suitable tools and techniques;
- understand the stages of a project and its components;
- use appropriate project planning and management tools.

INDICATIVE CONTENT

- Business Analysis in contemporary logistics systems.
- Business environment.
- Business planning.
- External environment.
- PEST Analysis.
- Linear versus Circular Business Planning.

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
Business Planning Exercise presented as an Essay	1,500 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4015	
Module Title	Business Planning	
Classification	Reading List entry	Electronic*
Essential	Coyle, J. J. et al (2016) <i>The Management of Business Logistics: A Supply Chain Perspective</i> 6 th Ed, Mason Ohio: Thompson	☐
Essential	Daniels, J., Radebaugh, L., and Sullivan, D. (2018) <i>International Business Global Edition</i> 16 th Ed, London: Pearson	☐
Essential	Winter, H. (2019) <i>The Business Analysis Handbook: Techniques and Questions to Deliver Better Business Outcomes</i> London: Kogan Page	☐
Further	Bak, O. (2018) <i>E-Business and Supply Chain Integration - Strategies and Case Studies from Industry</i> London: Kogan Page	☐
Further	Finch, B. (2022) <i>How to Write a Business Plan - Win Backing and Support for Your Ideas and Ventures</i> London: Kogan Page	☐
Further	Kerzner, H. (2009) <i>Project Management - A Systems Approach to Planning, Scheduling, and Controlling</i> 10 th Ed, Chichester: Wiley	☒
Further	Project Management Institute (2013) <i>A Guide to the Project Management Body of Knowledge (PMBOK® Guide)</i> Pennsylvania: Project Management Institute	☒

Module Code	ACMA4016
Title	Data Analytics Principles
Date	07/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To develop the knowledge and skills required to perform basic data analysis.
- To introduce students to data analytics techniques, tools and systems applied to logistics and supply chains.

LEARNING OUTCOMES

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

- understand the fundamental concepts and principles of data analysis, management systems and will be developing practical skills in using data analysis tools and systems in logistics and supply chains.

INDICATIVE CONTENT

- Data, and databases and management systems.
- The role of data in logistics and supply chains.
- Database, warehousing and analysis techniques.
- Data mining systems applied to logistics databases.
- Data analysis tools and systems.
- Logistics data management.
- Data Analytics in logistics and supply chains.
- The future of supply chain analytics.

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
Coursework including written report and data analysis	1,500 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4016	
Module Title	Data Analytics Principles	
Classification	Reading List entry	Electronic*
Essential	Marr, B. (2015) <i>Big Data: Using SMART Big Data Analytics and Metrics to Make Better Decisions and Improve Performance</i> Chichester: Wiley	☐
Essential	Tipi, N. (2021) <i>Supply Chain Analytics and Modelling: Quantitative Tools and Applications</i> London: Kogan Page	☐
Essential	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	Robertson, P. (2020) <i>Supply Chain Analytics</i> 1 st Ed, Abingdon: Taylor & Francis	☐

Module Code	ACMA4017
Title	Finance Management
Date	07/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To develop an appreciation and understanding of the significance of finance management within a company.
- To apply the theories and methods for managing finance to specific problems in logistics and supply chains.

LEARNING OUTCOMES

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

- demonstrate an understanding of finance management related to the logistics industries and supply chain management;
- evaluate the application of theories and methods of supply chain finance.

INDICATIVE CONTENT

- Costing Managing Budgets and Financial Statements.
- Managing Sustainable Finance.
- Inter-departmental relationships.
- Supply Chain finance and Credit Insurance requirements for suppliers.
- Cost of capital.
- Working capital management including influence from moving / improving payment terms and stock levels.
- Risk and hedging.
- NPV and investment criteria.
- Crypto currencies.

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
Presentation	15 minutes	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4017	
Module Title	Finance Management	
Classification	Reading List entry	Electronic*
Essential	Camerinelli, E. (2009) <i>Measuring the Value of Supply Chain Linking Financial Performance and Supply Chain Decisions</i> Farnham: Gower	☒
Essential	Tsai, S-B., Shen, C-H., Song, H. and Niu, B. (2019) <i>Green Finance for Sustainable Global Growth</i> Hershey PA: IGI Global	☐
Essential	McLaney, E. J. (2011) <i>Business Finance: Theory and Practice</i> , 9 th Ed, Harlow: Financial Times Prentice Hall	☒
Further	Weetman, P. (2016) <i>Financial Accounting: An Introduction</i> 7 th Ed, London: Pearson	☒

Module Code	ACMA4018
Title	Introduction to Procurement
Date	07/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To develop an appreciation and understanding of the application of procurement and purchasing.

LEARNING OUTCOMES

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

- describe and explain procurement and purchasing concepts and definitions and the different types of procurement;
- explain and understand outsourcing, managing and selecting suppliers.

INDICATIVE CONTENT

- Procurement and purchasing definitions, concepts and principles.
- Procurement as a strategic activity.
- Types of procurement.
- Procurement process.
- Outsourcing.
- Supplier selection.
- Procurement and markets.
- The Kraljick Matrix.
- The difference between public and private sector procurement.

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
Online exam	2 hours	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4018	
Module Title	Introduction to Procurement	
Classification	Reading List entry	Electronic*
Essential	Bailey, P. et al (2008) <i>Procurement, Principles and Management</i> London: FT Prentice Hall	☐
Essential	Mena, C. van Hoek, R. and Christopher, M. (2021) <i>Leading Procurement Strategy - Driving Value Through the Supply Chain</i> London: Kogan Page	☐
Essential	Lysons, K. and Farrington, B. (2020) <i>Purchasing and Supply Chain Management</i> 10 th Ed, London: Pearson	☐
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	ACMA4019
Title	Lean Thinking
Date	07/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To provide the students with the ability to apply lean thinking tools and systems in order to improve the quality of products, processes or services.

LEARNING OUTCOMES

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

- identify, adapt and use a range of tools and techniques to investigate problems, assess risk, and analyse areas for improvement;
- evaluate the techniques and practices used in lean management to implement and maintain sustainable logistic operations.

INDICATIVE CONTENT

- Main elements of Six Sigma, and DMAIC methodology.
- The Five principles of Lean Thinking :
 - Defining Value.
 - Mapping the Value Stream.
 - Creating Flow.
 - Using a Pull System.
 - Pursuing Perfection.
- The Eight Wastes of Lean Manufacturing, including Muda, Mura and Muri.
- A3 Thinking as part of the problem-solving process.
- Lean Supply Chain management and practices.

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
Problem-solving exercise	1,500 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4019	
Module Title	Lean Thinking	
Classification	Reading List entry	Electronic*
Essential	Rother, M. and Shook, J. (2009) <i>Learning to See</i> . Cambridge, MA: Lean Enterprise Institute,	☐
Essential	Smalley, A. and Sobek, D. (2008) <i>Understanding A3 Thinking</i> London: CRC Press	☐
Essential	Bicheno, J. and Bicheno, J. (2016) <i>The New Lean Toolbox</i> 5 th Ed, Buckingham: PICSIE Books	☐
Further	Roos, D., Womack, J. and Jones, D. (2014) <i>The Machine That Changed The World</i> London: Simon & Schuster	☐
Further	Baudin, M. (2004) <i>Lean Logistics: The Nuts and Bolts of Delivering Materials and Goods</i> New York NY: Productivity Press	☐
Further	Hajdul, M. and Mindur, L. (2015). <i>Lean and Reliable Digital Supply Chains – A Case Study</i> . LogForum 1(11), 15-27	☒
Further	Leite, H. R. and Vieira, G. E. (2015) <i>Lean Philosophy and its Applications in the Service Industry: A Review of the Current Knowledge</i> pdf 25(3), 529-541	☒
Further	Schneider, J. (2017) <i>Understanding Design Thinking, Lean and Agile</i> 1 st Ed Sebastopol: O'Reilly Media	☐

Module Code	ACMA4020
Title	Organisation Management
Date	07/08/2023
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To introduce the students to the theory and practice of organisation management as applied to logistics and supply chain management.
- To develop leadership skills for maintaining the competitiveness of the supply chains and logistics companies.

LEARNING OUTCOMES

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

- describe applied knowledge and understanding of the theories of organisation management;
- acquire knowledge of leadership theories and develop leadership skills in Supply Chain Management or Logistics Operations.

INDICATIVE CONTENT

- Project management.
- People management.
- Planning the workforce.
- Leadership.
- Productive working relationships.
- Leadership in Supply Chain Management or Logistics Organisations.

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
Essay	1,500 words	50%

Assessment Component 2

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Presentation	15 minutes	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4020	
Module Title	Organisation Management	
Classification	Reading List entry	Electronic*
Essential	Mullins, L. J. (2016) <i>Management and Organisational Behaviour</i> Harlow: Pearson Education Limited	☐
Essential	Mullins, L. J. and Christy, G. (2013) <i>Management and Organisational Behaviour</i> 10 th Ed, Harlow: Pearson Education Limited	☒
Essential	Mullins, L. J. and McLean, J. E. (2019) <i>Organisational Behaviour in the Workplace</i> 12 th Ed, Harlow: Pearson Education Limited	☐
Essential	Northouse, P.G. (2022). <i>Leadership: Theory and Practice</i> 9 th Ed, Los Angeles: SAGE	☒
Further	Evans, J. R. and Lindsay, W. M. (2019) <i>Managing for Quality and Performance Excellence</i> 10 th Ed, Andover: South-Western Cengage Learning	☐
Further	Sabri, E. H. (Ed) (2015) <i>Optimization of Supply Chain Management in Contemporary Organizations</i> Hershey PA: Business Science Reference	☐
Further	Beardwell, J. and Claydon, T. (eds) (2007) <i>Human Resource Management: A Contemporary Approach</i> Harlow: Pearson Education Limited	☐
Further	Cole, G. A. and Kelly, P. (2001) <i>Management Theory and Practice</i> 7 th (Revised) Ed, Andover: South-Western Cengage Learning	☐

Module Code	ACMA4021
Title	Study and Research Skills
Date	07/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To provide the students with the essential skills to study, undertake research, and communicate for effective learning.

LEARNING OUTCOMES

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

- identify, adapt and use suitable methods that can support learning through a reflective, active, positive approach to learning, and take responsibility for self-learning;
- evaluate the research and development approaches used in logistics and supply chains.

INDICATIVE CONTENT

- **Study Skills:** Understanding the learning process and identifying the appropriate skills, such as self-evaluation, skills needed for higher education, transferable skills, and action plans for personal development. Organising study, including effective time management and the organising of space and resources. Effective note-taking, use of the library and the internet, and implementation of referencing standards.
- **Research Skills:** Identifying and evaluating the academic literature. Critical and creative thinking, and reviewing of existing literature. Understanding the fundamentals of research methods.
- **Presentation Skills:** Communicating and presenting information (presentation techniques, styles, the appropriate use of graphs, charts, measures of central tendency). Developing the academic writing style (planning and structuring reports, linking ideas together, using facts, opinions or arguments, analytical thinking, etc.).

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	2 elements (equivalent of 1,500 words)	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4021	
Module Title	Study and Research Skills	
Classification	Reading List entry	Electronic*
Essential	Cottrell, S. (2010) <i>Skills for Success: The Personal Development Planning Handbook</i> 2 nd Ed, Basingstoke: Palgrave Macmillan	☒
Essential	Cottrell, S. (2019) <i>The Study Skills Handbook</i> 5 th Ed, London: Macmillan International Higher Education/Red Globe Press, an imprint of Springer Nature Limited	☐
Essential	Hopkins, D. and Reid, T. (2018) <i>The Academic Skills Handbook: Your Guide to Success in Writing, Thinking and Communicating at University</i> Los Angeles: SAGE	☐
Further	Sharp, J. A., Howard, K., and Peters, J. (2017) <i>The Management of a Student Research Project</i> Open University Press / London: Routledge / Gower	☐
Further	Open Learn (2022) <i>Skills for Study</i> Available at : https://www.open.edu/openlearn/skills-for-study	☒
Further	Smale, B. and Fowlie, J. (2015) <i>How to Succeed at University: An Essential Guide to Academic Skills and Personal Development</i> Los Angeles: SAGE	☐

Further	Cottrell, S. (2017) <i>Critical Thinking Skills: Effective Analysis, Argument, and Reflection</i> 3 rd Ed, Basingstoke: Palgrave Macmillan	☐
Further	Pears, R. and Shields, G. J. (2019) <i>Cite Them Right: the Essential Referencing Guide</i> . 11 th Ed, London: Macmillan International Higher Education	☒
Further	Well-being of Future Generations (Wales) Act 2015 (Online). Available at http://www.legislation.gov.uk/anaw/2015/2/contents/enacted	☐

Module Code	ACMA4022
Title	Supply Chain Informatics
Date	07/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To introduce students to supply chain information systems and recognise that the effective and innovative management of information can sustain competitive advantage.
- To develop students' understanding of the application of information technologies systems.

LEARNING OUTCOMES

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

- demonstrate a sound understanding of the application of information technology and systems (i.e. SAP-ERP) in logistics and supply chain management.

INDICATIVE CONTENT

- Information systems in supply chain management and logistics.
- The benefits and challenges of applying information technology in logistics.
- Information systems for product planning, materials management, inventory, transportation and distribution.
- Current information systems (e.g. enterprise systems such as ERP, CRM and SCM, e-Business, e-Marketing, e-HRM, e-Procurement, e-Learning, e-government, mobile commerce).
- Enterprise Resource Planning Systems Implementation and SAP-ERP.
- Analyse complex information in the supply chain.
- Knowledge management in logistics.
- Decision making 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
Report	1,500 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4022	
Module Title	Supply Chain Informatics	
Classification	Reading List entry	Electronic*
Essential	Chaffey, D. (2015) <i>Digital Business and E-Commerce Management</i> 6 th Ed, Harlow: Pearson	☒
Essential	Wang, Y. and Pettit, S. (2021) <i>E-Logistics: Managing Digital Supply Chains for Competitive Advantage</i> London: Kogan Page	☐
Essential	Pagano, A. and Liotine, M. (2020) <i>Technology in Supply Chain Management and Logistics : Current Practice and Future Applications</i> Amsterdam: Elsevier	☐
Further	Murphy, P. R. and Wood, D. (2008) <i>Contemporary Logistics</i> 9 th Ed, London: Pearson Prentice Hall	☐
Further	Mangan, J. (2016) <i>Global Logistics and Supply Chain Management</i> 3 rd Ed, Chichester: Wiley	☐
Further	Information Resources Management Association (2013) <i>Enterprise Resource Planning Concepts, Methodologies, Tools and Applications</i> Hershey PA: Business Science Reference	☐
Further	Ferran, C. and Salim, R. (2008) <i>Enterprise Resource Planning for Global Economies - Managerial Issues and Challenges</i> New York: IGI Global	☒

Module Code	ACMA4023
Title	Sustainability
Date	07/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To provide students with the knowledge and ability to assess sustainability and environmental impact considerations in logistics and supply chains.
- To enable students to understand the benefits of circular versus linear economy.

LEARNING OUTCOMES

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

- describe the requirements needed to evaluate sustainability in logistics and supply chain management;
- understand circular economy concepts and principles.

INDICATIVE CONTENT

- Environmental, social norms and standards for logistics companies and supply chain sustainability evaluation.
- The triple bottom line.
- Corporate social responsibility.
- Circular economy principles.
- Linear versus circular economies.
- The supply chain transformation from linear to circular.
- Innovation in SCM.
- Environmental Impact of logistics operations and reducing packaging.

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
Sustainability Assessment Exercise presented as an Essay	1,500 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4023	
Module Title	Sustainability	
Classification	Reading List entry	Electronic*
Essential	Kovacik, 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	☒
Essential	Weenk, E. and Henzen, R. (2021). <i>Mastering the Circular Economy - A Practical Approach to the Circular Business Model Transformation</i> London: Kogan	☐
Essential	Weetman, C. (2020) <i>A Circular Economy Handbook - How to Build a More Resilient, Competitive and Sustainable Business</i> London: Kogan	☒
Further	Kramberger, T., Potočan, V. and Ipavec, V. M. (2016) <i>Sustainable Logistics and Strategic Transportation Planning</i> Hershey PA: IGI Global	☒
Further	Heyzer, J. and Render, B. (2014) <i>Operations Management: Sustainability and Supply Chain Management</i> Harlow: Pearson.	☒
Further	Gupta, H. (2020) <i>Barriers and Overcoming Strategies to Supply Chain Sustainability Innovation</i> Elsevier, Amsterdam	☐

Further	Well-being of Future Generations (Wales) Act 2015 (online). Available at www.legislation.gov.uk/anaw/2015/2/contents/enacted	☒
---------	---	---

Module Code	ACMA4024
Title	Warehousing and Inventory Operations
Date	07/08/2023
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with fundamental knowledge and skills in the development and management of warehouses.
- To understand efficient inventory management and optimisation strategies.

LEARNING OUTCOMES

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

- describe a range of issues that need to be considered as part of warehousing operations;
- explain the role of inventory in businesses and which factors need to be considered when managing inventory.

INDICATIVE CONTENT

- Role of the warehouse.
- Warehouse layouts.
- Inventory control and management.
- Stock control and accountancy.
- Order management.
- Materials handling.
- Customer service.
- Control supplies at storage locations.
- Packaging systems design and management.

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
Case Study Report	1,500 words	50%

Assessment Component 2

(Tick one)

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Presentation	15 minutes	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4024	
Module Title	Warehousing and Inventory Operations	
Classification	Reading List entry	Electronic*
Essential	Richards, G. (2021), <i>Warehouse Management: A Complete Guide to Improving and Minimising Costs in the Modern Warehouse</i> 4 th Ed, London: Kogan Page	☐
Essential	Mangan, J. (2016). <i>Global Logistics and Supply Chain Management</i> 3 rd Ed, Chichester: Wiley	☐
Essential	Martin, H. (2018) <i>Warehousing and Transportation Logistics Systems, Planning, Application and Cost Effectiveness</i> London: Kogan Page	☐
Further	Murphy, P. R. and Wood, D. (2008) <i>Contemporary Logistics</i> 9 th Ed London: Pearson Prentice Hall	☐
Further	Relph, G. and Milner, C. (2019) <i>The Inventory Toolkit - Business Systems Solutions</i> London: Kogan Page	☐

Module Code	ACMA4025
Title	Introduction to Engineering Operations Management
Date	04/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To analyse engineering operations, including supply chains and logistics considerations that integrate strategic planning, scheduling systems, and transport planning.

LEARNING OUTCOMES

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

- understand the fundamental principles of operations management within an engineering context, including the development and strategic importance of supply chains operations;
- Evaluate logistics operations techniques and practices for innovation in SCM.

INDICATIVE CONTENT

- Risk Management in Engineering/Production.
- Supply Chain Design.
- Logistics Operations.
- Strategic Innovation in operations and supply chain management.
- Transportation all modes and planning.
- Schedule logistics operations.
- Multiple transport modes.

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

☐ 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	ACMA4025	
Module Title	Introduction to Engineering Operations Management	
Classification	Reading List entry	Electronic*
Essential	Rushton A. et al, (202). <i>The Handbook of Logistics and Distribution Management: Understanding the Supply Chain</i> 7th Ed, London: Kogan Page	☐
Essential	Slack, N. & Brandon-Jones, A. (2022). <i>Operations management</i> (10th ed.). Pearson.	☒
Essential	Mangan, J. (2020). <i>Global logistics and supply chain management</i> (4th ed.). Wiley.	☐
Further	Rodrigue, JP., Notteboom, T., & Shaw, J. (2014). <i>The SAGE Handbook of Transport Studies</i> . SAGE.	☒

Module Code	ACMA4026
Title	Material Science Fundamentals
Date	04/08/2023
Level	4
Credits	10
Pre-Requisites	None

AIM(S)

- To introduce the structure, properties and manufacture of different types of materials, including metals, polymers, ceramics and composites.
- To provide real-life industrial cases to enhance learners' experience and inspire students to be future metallurgists, materials scientists and engineers.

LEARNING OUTCOMES

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

- demonstrate understanding of the structure, properties and basic selection of each of the fundamental material classes;
- describe the processes used to manufacture, shape and test a range of materials including polymers, metals, ceramics and composites.

INDICATIVE CONTENT

- Bonding in materials, including ionic bonding, covalent bonding and metallic bonding.
- Microstructures, including typical examples from metallic, ceramic, polymeric, composite, and natural (biological) materials and appreciate its importance in determining material properties.
- Link between strength and nature of bonding/microstructure in various materials, e.g. metals, alloys, ceramics and composites.
- Fundamental working principles of different types of mechanical tests (Tensile, Compression, Fatigue, Impact and Creep Tests etc.).
- Analysis/interpretation of test results to extract useful mechanical properties, e.g. Strength, Stiffness, Toughness, Ductility, etc.
- Manufacturing processes used to shape a range of materials including polymers, metals, ceramics and composites.
- Characterisation of microstructure and chemical constituents in product materials such as Metals and Alloys, Polymers, Fibre based Composites and Ceramics.
- Use problem solving, critical thinking, numeracy in the context of real-life industrial case studies, including material science applications in medical engineering.

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		
TOTAL	100	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	2000 words	100%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4026	
Module Title	Material Science Fundamentals	
Classification	Reading List entry	Electronic*
Essential	Lecture slides and Case Studies.	☒
Essential	W F Smith; J Hashemi and F Presuel-Moreno (2019), <i>Foundations of Materials Science and Engineering</i> , New York: McGraw – Hill Education	☐
Further	Callister, WD and Rethwisch, DG (2020), <i>Callister's Materials Science and Engineering</i> , 10th edition, John Wiley & Sons, 2020	☒
Further	Ashby, M. and Jones, D., (2018) <i>Engineering Materials: An Introduction to Properties, Applications and Design</i> - 5th Edition, Butterworth Heinemann	☐
Further	Ashby, M.F. (2016) <i>Materials Selection in Mechanical Design</i> , 5th Edition, Butterworth-Heinemann	☐

Module Code	ACMA4027
Title	Problem Solving Techniques
Date	04/08/2023
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To provide students with the ability to develop generic solutions to problems using abstract thinking skills.

LEARNING OUTCOMES

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

- evaluate a problem and formulate requirements and constraints;
- analyse a problem and produce a logical solution.

INDICATIVE CONTENT

- Deconstructing Technical Language and Identifying Problems.
- Problem solving approaches and techniques.
- Interpreting natural language problems.
- Subdividing problems.
- Constraining problems.
- Determining generic and specific solutions.
- Abstract thinking skills.
- Critical Thinking Skills.
- Reapplying solutions across different contexts.
- Rules, heuristics and algorithms.
- Logic and rhetoric.
- Logical fallacies.
- Boolean algebra.
- Statistics and analysing results.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Practical – for example, a Moodle-based quiz or a task such as flowcharting a problem	1 hour	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written assessment	2000 words	50%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA4027	
Module Title	Problem Solving Techniques	
Classification	Reading List entry	Electronic*
Essential	Curzon P and McCowan P (2017) Power Of Computational Thinking, The: Games, Magic And Puzzles To Help You Become A Computational Thinker, World Scientific	☒
Essential	Levitin, A and Levitin, M (2011) Algorithmic Puzzles, Oxford University Press.	☒
Essential	Borman, D. (2018). Statistics 101: From data analysis and predictive modeling to measuring distribution and determining probability, your essential guide to statistics. Simon and Schuster.	☒

Essential	Carlson, W. (2022). Statistics for Business and Economics: Global Edition, 10 th Edition. Pearson Education.	☒
Further	Michalewicz, M and Michalewicz Z (2014), Puzzle-based Learning; An introduction to critical thinking, mathematics and problem solving, 3 rd Edition Hybrid Publishers.	☒
Further	Carroll, N. R. (2009). The communication problem solver: simple tools and techniques for busy managers. Amacom.	☒
Further	Fraser, Jen and Anthony, P (2014) Everyone's a Genius: Simple Tips to Boost Your Brilliance Now, Ideation Training Pty Ltd	☒
Further	Çeviker-Çınar, G., Mura, G., & Demirbağ-Kaplan, M. (2017). Design thinking: A new road map in business education. The Design Journal, 20(sup1), S977-S987.	☒
Further	Gardner, M (1978) aha! Insight, Scientific American.	☒
Futher	Sterling, M. J. (2008). Business Math for Dummies. John Wiley & Sons.	☒
Further	McInerney, D Q (2005) Being Logical, Random House	☒
Further	Watanbe, K (2009) Problem Solving 101: A Simple Book for Smart People	☒