

MODULE DIRECTORY

LEVELS 4, 5 and 6

ACADEMIC DISCIPLINE OF:

Mechanical & Manufacturing Portfolio

INSTITUTE OF SCIENCE & ART

2020-2021

INTRODUCTION

This Module Directory includes all the modules for Level 4, 5 and 6 within the Mechanical & Manufacturing Portfolio in the academic year 2020-2021.

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.

Note that due to the delivery model of the Part-Time awards within this portfolio, often two consecutive levels are studied at the same time. Due to this, this handbook contains all information for all levels and should be used by all students studying a programme within this portfolio.

MODULE DOCUMENTS

Contents

Level 4	5
Electrical and Electronic Principles ACDA4006	6
Energy and Environmental Technology ACEA4003.....	9
Engineering Design ACEA4004.....	12
Engineering Mathematics ACEA4005	15
Engineering Science ACHA4002	17
Engineering Applications and Study Skills ACEA4007	20
Materials & Introduction to Manufacturing Technology ACMA4000	23
Physical Science for Materials ACMA4001	26
Plant Operations and Performance ACMA4002	29
Project Design ACMA4003	32
Quality and Business Improvement ACMA4004.....	35
Level 5	38
Dynamics Control and Instrumentation ACHA5001	39
Management, Innovation and Sustainability ACEA5002	42
Environmental Engineering & Sustainable Energy ACEA5003.....	45
Group Design Project ACEA5004	48
Group Industrial Project ACMA5000.....	51
Manufacturing Design and Technology ACMA5002	54
Manufacturing with Materials ACMA5003	57
Manufacturing with Materials ACMA5003	59
Materials in Service ACMA5004.....	60
Six Sigma Green Belt ACMA5005	63
Stress Analysis & Dynamics ACEA5006	66
Structure and Properties of Materials ACMA5006	69
Thermofluid Mechanics ACHA5007	72
Thermofluids and Control ACHA5008.....	75
Control and Automation	78
Electronics.....	80
Level 6	81
Advanced Processes & Materials ACMA6000.....	82
Advanced Thermofluid Mechanics ACHA6000	85
Computational Methods ACEA6002	88

Control Technology ACMA6001.....	91
Environmental Pollution Control ACEA6003.....	94
Major Project ACEA6004.....	98
Manufacturing Systems & Simulation ACMA6002	101
Metallurgy of Non-Ferrous Alloys ACMA6004.....	104
Metallurgy of Steel ACMA6005.....	107
Plant and Asset Engineering ACMA6007	110
Procurement and Negotiation ACMA6008	113
Structural and Fluid Analysis ACEA6005	116
Welding Engineering ACMA6009.....	119
Advanced Electronics	122

Level 4

Module Code	ACDA4006
Title	Electrical and Electronic Principles ACDA4006
Date	24/04/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To provide the student with a sound knowledge of fundamental circuit/network analysis tools through real world component behaviour, and to apply these tools in a practical environment.

LEARNING OUTCOMES

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

- Analyse specified circuits and networks using appropriate analysis tools.
- Perform electrical / electronic measurements, record and analyse data and produce a report.

INDICATIVE CONTENT

- Ohm's Law
- Series/parallel connections for R,L and C
- KVL and KCL
- Potential and Current divider networks
- Voltage and Current sources
- Thevenin and Norton equivalent circuits
- Principle of Superposition
- Mesh and Nodal analysis
- AC fundamentals
- Sinusoidal properties
- Resistance, Reactance and Impedance
- Complex notation

- Single phase AC circuits
- Maximum Power Transfer
- Tuned Circuits
- Semiconductors, diodes and transistors, Thyristors, Diacs and Triacs
- Electromagnetism , Electromagnetic Induction, Faraday's , Lens' Laws etc
- Principles of motors and generators

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	80%

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Report	1,000 words	20%

Assessment Summary

Activity type	Percentage
Written exam	80%
Coursework	20%
Practical	
TOTAL	100%

AHEP3 Version 3 outcomes to be met:

SM1b, SM3b, EA1b, EA4b, P3, G1

INDICATIVE READING LIST

Module Code	ACDA4006	
Module Title	Electrical and Electronic Principles	
Classification	Reading List entry	Electronic*
Essential	Bird, J., Electrical circuit Theory and Technology, 6 th Edition (Routledge, 2017)	☒
Essential	Floyd, T., DC / AC Fundamentals: A System Approach (Pearson, 2012)	☐
Further	Sinclair, I., Practical Electronics Handbook, 6 th Edition (Newnes, 2007)	☐

Module Code	ACEA4003
Title	Energy and Environmental Technology ACEA4003
Date	24/04/2020
Level	4
Credits	20
Pre-Requisites	None

AIM(S)

- To enable the student to gain an awareness of the principles of power generation and technologies available to control pollution

LEARNING OUTCOMES

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

- Understand how electricity is generated from conventional sources- fossil fuels and nuclear sources (fission and fusion)
- To understand the main principles used to control pollution and the technologies that can be used to manage and control pollution

INDICATIVE CONTENT

- Nuclear power generation by fission, fusion, alternative fuel sources and the issue of how to manage nuclear waste
- Conventional power generation by fossil fuels and power distribution principles and technologies used to control pollution to air
- Application of equilibrium expressions for acid-base, air water, oxidation-reduction and kinetics of reaction
- Mass balance principles for (batch mixed flow reactors)
- Technologies/processes such as anaerobic digestion and composting for recycling of waste stream and technologies employed to manage exhaust gas emissions

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	2,500 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Examination	2 hours	50%

Assessment Summary

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

AHEP 3 Version 3 outcomes to be met;
SM1b, EA2, EL2, EL4, P1, P2, P3

INDICATIVE READING LIST

Module Code	ACEA4003	
Module Title	Energy & Environmental Technology	
Classification	Reading List entry	Electronic*
Essential	Breeze, P Power Generation Technologies, 2 nd Edition, Newnes	☐
Essential	Joyce, M (2017) Nuclear Engineering A Conceptual Introduction to Nuclear Power, Butterworth Heinemann	☐
Essential	Korres, N O'Kiely, P Benzie, J and Werst, J (2018) Bioenergy Production by Anaerobic Digestion, Routledge	☐
Essential	Mihelcic, J and Zimmerman, J (2014) Environmental Engineering: Fundamentals, Sustainability Design, 2 nd Edition, John Wiley and Son	☐
Further	Gonen, T (2014) Electric Power Distribution Engineering, 3 rd Edition, CRC Press	☐
Further	Masterton, R (2016) Nuclear Engineering Fundamentals: A Practical Perspective, CRC Press	☐
Further	Pullen, T (2014) Anaerobic Digestion-Making Biogas-Making Energy, Routledge	☐
Further	Girard, J (2013) Principles of Environmental Chemistry, 3 rd Edition, Jones and Barlett	☐
Further	Journal of Cleaner Production	☐
Further	Applied Energy	☐
Further	Energy Conservation and Management	☐
Further	International Journal of Electrical Power & Energy Systems	☐
Further	Thermal Science and Engineering Progress	☐
Further	Nuclear Engineering and Design	☐
Further	Science of the Total Environment	☐
Further	www.carbontrust.com	☐
Further	www.defra.gov.uk	☐
Further	www.environmental-agency.gov.uk	☐
Further	www.ciwem.co.uk	☐
Further	www.ciwem.org	☐
Further	www.water-pollution.org.uk	☐
Further	www.epa.gov	☐

Module Code	ACEA4004
Title	Engineering Design ACEA4004
Date	24/04/2020
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.) 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	2500-word report	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met: D1i, D5i, P7, G4i.

INDICATIVE READING LIST

Module Code	ACEA4004	
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	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	ACEA4005
Title	Engineering Mathematics ACEA4005
Date	24/04/2020
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

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	24%
Independent learning	152	70%
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%

AHEP3 Version 3 outcomes to be met:
SM2b, EA1b, G1

INDICATIVE READING LIST

Module Code	ACEA4005	
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 (Palgrave Macmillan, 2007)	☐
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	ACHA4002
Title	Engineering Science ACHA4002
Date	24/04/2020
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

- Dynamics
- Friction
- Linear and Angular motion – inertia, radius of gyration etc
- Newton's Laws
- SHM
- Work / energy / momentum / power
- Static and dynamic: A calculative and analytical considerations of the bending equation, $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ and torsion equation, $\frac{T}{J} = \frac{\tau}{r} = \frac{G\theta}{l}$, moments, uniform linear and rotary motion, simple energy systems and mechanical oscillations.

- Analysis of thermal heat transfer through conduction, $Q = \frac{-kA(T_2 - T_1)}{x}$, convection,

$$Q = hA(T_2 - T_1) \text{ and radiation, } Q = 56.7\varepsilon A \left[\left(\frac{T_2}{1000} \right)^4 - \left(\frac{T_1}{1000} \right)^4 \right].$$

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	1500 words	30%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Phase Test	2 hours	70%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

SM1i, EA2i, EA3i,

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	ACEA4007
Title	Engineering Applications and Study Skills ACEA4007
Date	24/04/2020
Level	4
Credits	20
Pre-Requisites	None

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. 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 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

INDICATIVE CONTENT

- Understanding the learning process and identifying skills (eg self-evaluation, skills needed for higher education, transferable skills, action plans for personal development).
- Organising study (eg 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 (eg 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.)

- 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.

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	2000 words total	40%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report / presentation demonstrating proficiency of engineering software.	3000 words	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met;
 SM3b, EA4b, D2, D6, EL1, EL5, EL6, P2, P3, P4, P6, G1, G2, G4
 EA4i, EL6i, P2i, P3i, P4i, P6i, G4i

INDICATIVE READING LIST

Module Code	ACEA4007	
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 (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	Sizemore, J., MATLAB for dummies (John Wiley & Sons, 2015)	☒
Further	Health and Safety Executive www.hse.gov.uk	☒

Module Code	ACMA4000
Title	Materials & Introduction to Manufacturing Technology ACMA4000
Date	24/04/2020
Level	4
Credits	20
Pre-Requisites	None

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 demonstrate

- 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	50	25%
Independent learning	150	75%
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 & 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%

AHEP 3 Version 3 Outcomes to be met:

SM1i, SM1b, P1, P2, P4, G1,

INDICATIVE READING LIST

Module Code	ACMA4000	
Module Title	Materials & 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 ACMA4001
Date	24/04/2020
Level	4
Credits	20
Pre-Requisites	None

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 demonstrate:

- 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
- 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 (eg 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	1,500 words	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

EA1b, P1

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 ACMA4002
Date	24/04/2020
Level	4
Credits	20
Pre-Requisites	None

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	2,500 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%

AHEP3 Version 3 outcomes to be met:

EA1b, D2, EL3b, P1

SM1i, EA1i, D2i, D5i, EL3i, P1i

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	☐
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Module Code	ACMA4003
Title	Project Design ACMA4003
Date	24/04/2020
Level	4
Credits	20
Pre-Requisites	None

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	2500 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%

AHEP 3 Version 3 outcomes to be met:

SM1b, EA4b, D1, D2, D3b, D5, D6, EL2, EL3b, EL6, P1, P2, P4, P8, P1b, G1, G2, G3, G4, SM1i, Ea4i, D1i, D2i, D3, D5i, EL3i, EL6i, P1i, P2i, P4i, P11

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 ACMA4004
Date	24/04/2020
Level	4
Credits	20
Pre-Requisites	None

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,
- Failure modes effects analysis- process, systems service FMEAs, benefits and continuous improvements
- 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	2500 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Report	2500 words	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
D2

SM2i, EA1i, D2i, EL2, EL6i, P4i

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	☒

Level 5

Module Code	ACHA5001
Title	Dynamics Control and Instrumentation ACHA5001
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To enable the student to develop an understanding of a wide range of mechanics and dynamics problems and appropriate analysis methodologies
- To enable the student to recognise how the application of control systems and instrumentation can be used to effectively measure, control and manage the dynamics of mechanical systems and electrical systems

LEARNING OUTCOMES

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

- Solve, analyse and simulate the behaviour of dynamic mechanical systems using traditional analytical techniques and computer-based simulation
- Demonstrate an understanding of instrumentation, and apply control system methodologies to dynamic systems and analyse the behaviour and response of the system and how it can be controlled

INDICATIVE CONTENT

- Introduction to Dynamics
- Kinematics of Particles
- Kinetics of Systems of Particles
- Dynamics of Rigid Bodies
- Resultant accelerations and forces of rotating Rigid Bodies
- Effect of friction on dynamic systems
- Vibration and Time Response
- Measurement system elements
- System modelling and analysis
- Control Strategies
- Mathematical models of open and closed loop systems
- Block diagrams, signal flow diagrams and fundamentals of transfer functions
- Dynamic response of systems and introduction to system stability

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	2500 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

M1b, SM2b, EA2, EA3b, P8, G1

INDICATIVE READING LIST

Module Code	ACHA5001	
Module Title	Dynamics Control and Instrumentation	
Classification	Reading List entry	Electronic*
Essential	Meriam, J. L., Kraige, L. G. and Bolton, J.N., Engineering Mechanics: Dynamics, 8 th Ed. SI Version (John Wiley & Sons, 2015)	☐
Essential	Bird, O.J. & Ross, C.T.F., Mechanical Engineering Principles, 2 nd Ed. (Routledge, 2012)	☐
Further	Bolton, W., Engineering Science, 5 th Ed. (Oxford: Elsevier Newnes, 2006)	☐
Essential	Nise, N.S., Control Systems Engineering - 7 th Edition (John Wiley & Sons, 2013)	☐
Further	Janardan, P.J. & Vishnu, P., Instrumentation and Process Control (New Delhi: I.K. International Publishing, 2010)	☐
Further	Science Direct: www.sciencedirect.com	☒
Further	Morris, A.S. & Langari, R., Measurement and Instrumentation: theory and application (Elsevier Inc., 2012)	☐

Module Code	ACEA5002
Title	Management, Innovation and Sustainability ACEA5002
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Assignment	2500 words	50%

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

SM2b, D1, D2, D5, EL1, EL2, EL3b, EL4, EL5, EL6, P5, P11b, G3b

SM2i, D1i, D2i, D5i, EL3i, EL6i, P11i, G3i.

INDICATIVE READING LIST

Module Code	ACEA5002	
Module Title	Management, Innovation and Sustainability	
Classification	Reading List entry	Electronic*
Essential	Krietner, R., Principles of Management 12th Edition (South Western College, Jan 2012)	☐
Essential	Maylor, H., Project Management 4th Edition (FT Prentice Hall, 2010)	☒
Essential	Mullins L.J, H., Management and Organisational Behaviour (Pearson Education, 2013)	☒
Further	Bowen, R., Engineering Ethics (Springer International Publishing, 2014)	☒
Further	Masterman, G., Sponsorship – for a Return on Investment Butterworth (Heinemann, 2007)	☒
Further	Kotler, P., Principles of Marketing 17th Edition (FT Prentice Hall, 2018)	☒
Further	Dyson, J., Accounting for Non-Accounting Students 8th Edition (FT Prentice Hall, 2010)	☐
Further	General Management www.mindtools.com	☒
Further	Sustainable Business http://www.edie.net/index.asp	☒

Module Code	ACEA5003
Title	Environmental Engineering & Sustainable Energy ACEA5003
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To understand the principles applied in environmental engineering and how the different sources of renewable energy generate electricity

LEARNING OUTCOMES

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

- Understand how a range of renewable energy sources can be used to generate electricity while considering engineering, operational, and economic issues
- To assess environmental risk and understand potential methods used to control risk using physical chemical and biological concepts

INDICATIVE CONTENT

- Conventional forms of renewable energy for power generation – wind, solar and hydro power
- Geothermal energy- methods used and other applications of geothermal properties
- Energy from biomass and waste
- Economics of using renewable energy
- Contemporary developments in renewable energy
- Environmental risk- perception, risk assessment, risk mitigation and risk management
- Toxicity, BOD and COD
- Bioaccumulation and bioconcentration and the problems it can cause in the environment

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	2,500 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Examination	2 hours	50%

Assessment Summary

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

AHEP 3 Version 3 outcomes to be met:
D1, D6, EL2, EL4, P2, P4, P6 and P8

INDICATIVE READING LIST

Module Code	ACEA5003	
Module Title	Environmental Engineering & Sustainable Energy	
Classification	Reading List entry	Electronic*
Essential	Twidell, J and Weir, T (2015) Renewable Energy Resources, 3 rd Edition, Routledge	☐
Essential	Boyle, G (2012) Renewable Energy: Power for a Sustainable Future, 3 rd Edition, Oxford University Press	☐
Essential	Mihelic, J and Zimmermann, J (2009) Environmental Engineering Fundamentals and Sustainability, John Wiley and Son	☐
Further	Masters, G and Ela, W (2013) Introduction to Environmental Engineering and Science, 3 rd Edition, Pearson	☐
Further	Breeze, P (2005) Power generation Technologies, Elsevier	☐
Further	Andrews, J and Jelley, N (2013) Energy Science Principles, Technologies and Impacts, 3 rd Edition, Oxford University Press	☐
Further	Burton, A Jenkins, N Shape, D and Bossany, E (2011) Wind Energy Handbook, 2 nd Edition, John Wiley and Son	☐
Further	Smets, A Jager, K Isabella, O Van Swaaij, D and Zeman, M (2016) Solar Energy: The Physics and Engineering of Photovoltaic Conversion, Technologies and Systems, UIT Cambridge	☐
Further	Everett, B Boyle, G Peake, S and Ramage, J (2011) Energy Systems and Sustainability: Power for a Sustainable Future	☐
Further	Davis, M and Cornwell, D (2008) Environmental Engineering, 4 th Edition, McGraw Hill	☐
Further	Franchetti, M and Apul, D (2012) Carbon Footprint Analysis: Concepts Methods Implementation and Case Studies, CRC Press	☒
Further	Resources Conservation and Recycling	☒
Further	Energy Conservation and Management	☒
Further	Energy and Buildings	☒
Further	Renewable and Sustainable Energy Reviews	☒
Further	Science of the Total Environment	☒
Further	Journal of Cleaner Production	☒
Further	Trends in Biotechnology	☒
Further	Journal of Environmental Management	☒
Further	www.carbontrust.com	☒
Further	www.defra.gov.uk	☒
Further	www.environmental-agency.gov.uk	☒
Further	www.ciwem.co.uk	☒
Further	www.ciwem.org	☒
Further	www.water-pollution.org.uk	☒
Further	www.epa.gov	☒

Module Code	ACEA5004
Title	Group Project ACEA5004
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

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

Where students have completed a work placement;

- To reflect upon the experiences gained during a 6 week industrial placement that took place during the end of the first year of the programme

LEARNING OUTCOMES

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

- show a detailed knowledge and understanding of project management strategies in the planning, researching, implementing and documenting progress and achievement and demonstrate subject specific skills with respect to planning and executing an engineering project within time and budget constraints, considering the environment and sustainability
- show cognitive skills in the research and analysis of technical and business concerns and how these may conflict
- demonstrate key transferable skills in working as part of a team, time management, communication and presentation skills.

INDICATIVE CONTENT

- Systematic design and development procedures.
- CAE, CAD and Engineering Design
- Research methodologies and techniques.
- Objective design and development selection.
- Project Planning.
- Statistical Techniques and Evaluation.
- Cost prediction, manufacturing and sustainability.
- Quality and reliability.
- Technical report writing.
- Group working and management.
- Communication skills.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Where student conducts a work placement;

Assessment will be by means of a report reflecting on the work placement undertaken and a group report and supporting viva documenting the group project carried out.

OR

Where student does not conduct a work placement;

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

Assessment Component 1

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Interim Viva / Work Placement Viva Report	15 mins	30%

Where students have completed a work placement, component 1 will be a report reflecting on the work placement and the experience gained through it.

Assessment Component 2

☐ Written exam ☐ Coursework ☒ Practical

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

Assessment Component 3

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written Project report	2500 words (per member of group)	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

SM1b, EA4b,D1,D2,D3b,D5,D6,EL2,EL3b,EL6,P1,P2,P4,P8,P11b,G1,G2,G3,G4

SM1I,EA4i,D1i,D2i,D3,D5i,EL3i,EL6i,P1i,P2i,P4i, P11i,

INDICATIVE READING LIST

Module Code	ACEA5004	
Module Title	Group Design Project	
Classification	Reading List entry	Electronic*
Essential	Maylor, H., Project Management 4th Edition (FT Prentice Hall, 2010)	☐
Further	Seppala, N., Business Ethics and Corporate Social Responsibility (Cengage Learning, 2010)	☐
Further	Masterman, G., Sponsorship – for a Return on Investment Butterworth (Heinemann, 2007)	☐

Module Code	ACMA5000
Title	Group Industrial Project ACMA5000
Date	24/04/2020
Level	5
Credits	40
Pre-Requisites	None

AIM(S)

- To undertake an industry based project demonstrating the application of project management techniques and the use of a range of tools and techniques applied to the chosen industrial project.

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☐ Coursework ☒ Practical

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

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

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

Assessment Component 3

☐ Written exam ☒ Coursework ☐ Practical

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

Assessment Component 4

☐ Written exam ☐ Coursework ☒ Practical

Mode of assessment	Volume	Weighting
Presentation	15 minutes	25%

Assessment Summary

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

AHEP 3 Version 3 outcomes to be met:
E4b, D1, D2, D4, D5, D6, EL2, EL3b, P2, P6, P7, P8

INDICATIVE READING LIST

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

Module Code	ACMA5002
Title	Manufacturing Design and Technology ACMA5002
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

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

LEARNING OUTCOMES

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

- use appropriate design methods in conjunction with advanced features of a 3D CAD system in engineering design.
- evaluate with a view to improving the selection and optimisation of existing manufacturing processes through the application of physical principles of these processes
- analyse computational methods for the manufacture and intellectual skills in the appraisal of mechanical components the limitations of manufacturing processes in respect to their effects on both operating conditions and material performance.

INDICATIVE CONTENT

- Design Algorithms including Design for Six Sigma and Total Design
- Overview of design tools including Quality Function Deployment, Axiomatic Design, TRIZ, Design for X, VA / VE, Failure Mode-Effect Analysis, Taguchi's orthogonal array, Tolerance design and Design Verification / Product Validation.
- Mechanical tolerance calculations and tolerance stack-up analysis including GD&T
- Moldflow analysis, Sheet metal design analysis and Motion Simulation and Animation.
- Primary processes. – casting (mould design, feeding mechanisms, metallurgical considerations, casting systems and defects: deformation processes-rolling theory, forging, extrusion and drawing (die-design, process parameters, and defects).
- Computer Aided Manufacturing Technologies and applications including Computer Numerical Control Principles.

- Polymeric and ceramic material processing (Mould design, process parameters and defects)
- Role of Additive Manufacturing in the product development process and future applications and development of the technology.
- Design for Additive Manufacturing, including part consolidation and redesign. Looking at the unique capabilities of shape, functional and material complexities.
- Materials and the environment: Recycling, corrosion, UV degradation, hygroscopy.
- Material failure: Fatigue, creep and fracture, crack criteria, stress concentration factors, residual stresses. Preventative measures and design implications.
- Cambridge Engineering Selector (CES) software database.

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
Design Project	5000 words	100%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, EA4b, D4, EL1, EL2, P7, G1

INDICATIVE READING LIST

Module Code	ACMA5002	
Module Title	Manufacturing Design and Technology	
Classification	Reading List entry	Electronic*
Essential	Pugh, S., Total Design: Integrated Methods for Successful Product Engineering (Prentice Hall 1990)	☐
Essential	Groover, M. P., Principles of Modern Manufacturing, 4 th Edition (John Wiley & Sons, 2016)	☒
Essential	Xiaozhong, R., Fundamentals of Manufacturing Technology, (Alpha Science International Ltd., 2019)	☐
Further	Chanda, M. and Roy, S. K., Plastic Fundamentals, Properties and Testing (Boca Raton, 2009)	☐
Further	Milewski, J.O., Additive Manufacturing of Metals: From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewelry (Springer, 2017)	☒
Further	Campbell, J., Complete Casting Handbook: Metal Casting Processes, Metallurgy, Techniques and Design, 2 nd Edition (Butterworth-Heinemann, 2015)	☒
Further	Gebhardt, A., Understanding Additive Manufacturing: Rapid Prototyping - Rapid Tooling - Rapid Manufacturing (Hanser Fachbuchverlag, 2011)	☐
Further	Bitonti, F., 3D Printing Design: Additive Manufacturing and the Materials Revolution. (Bloomsbury Visual Arts, 2019)	☒
Further	Locke, R. M and Wellhausen, R., Production in the Innovation Economy (MIT Press, 2014)	☐

Module Code	ACMA5003
Title	Manufacturing with Materials ACMA5003
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To provide the student with an in-depth understanding of a wide range of manufacturing processes and their effects on the structure and behaviour of materials

LEARNING OUTCOMES

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

- Analytical skills in the analysis and interpretation of key variables in a range of manufacturing processes
- Cognitive skills in the evaluation of performance and their effects on material structure and properties
- Intellectual and analytical skills in design interpretation and specification of appropriate manufacturing processes

INDICATIVE CONTENT

- Extraction and processing of metals – iron and steelmaking, blast furnace operations, basic oxygen steelmaking, electric arc steelmaking, casting (ingot and continuous). Extraction and processing of non-ferrous metals
- Casting processes – process technology, Chvorinov diagrams, casting system design. Process parameters for die casting. Continuous casting. Refractory furnace linings
- Forming processes for metals – hot and cold rolling mills, rolling theory. Forging, extrusion, Drawing processes. Analysis of process mechanics. Forming limit diagrams.
- Cutting processes – mechanisms of cutting. Forces and temperature in cutting. Tribological aspects of cutting. Process performance. Tool design and materials. Wear mechanisms. Non-traditional cutting processes. Surface finish
- Joining processes – metallurgy of welding, welding processes. Adhesive bonding.
- Manufacturing methods with thermoplastics; Casting and extrusion, film and fibre production, blow moulding, compression and transfer moulding, injection moulding
- Design considerations and common faults with injection moulding; thermoforming and rotational moulding
- Manufacturing methods with thermosets and rubbers. Polymer joining and finishing methods including bonding, welding, fastening, printing and coating
- Heat treatment of metals and surface coating
- Powder processing of ceramics and metals
- Additive manufacturing processes and rapid processing

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	90 minutes	70%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Assessment of practical work	1500 words	30%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
EA1b, P2, G1

INDICATIVE READING LIST

Module Code	ACMA5003	
Module Title	Manufacturing with Materials ACMA5003	
Classification	Reading List entry	Electronic*
Essential	Black, J. T. and Khoser, R. A., Materials and Processes in Manufacturing: SI Version, 12 th Edition (Wiley, 2018)	☐
Essential	Zhang, J., Jung, Y.-G., Additive Manufacturing: Materials, Processes, Quantifications and Applications (Butterworth-Heinemann, 2018)	☐
Essential	Schrader, G. F. and Elshennawy, A. K., Manufacturing Processes and Materials (Society of Manufacturing Engineers, 2000)	☐
Further	Gurugubelli, S.N., Prasad, K.S., Advanced Materials and Manufacturing Processes (Advanced Materials Research) (Trans Tech Publications Ltd, 2018)	☐
Further	Campbell, J., Complete Casting Handbook: Metal Casting Processes, Metallurgy, Techniques and Design, 2 nd Edition (Butterworth-Heinemann, 2015)	☐
Further	Ghosh, A. and Chatterjee, A., Ironmaking and Steelmaking: Theory and Practice (Prentice Hall, 2008)	☐
Further	Hosford, W. F. and R.M. Cadell, R. M., Metal Forming: Mechanics and Metallurgy (Cambridge University Press, 2007)	☐

Module Code	ACMA5004
Title	Materials in Service ACMA5004
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To provide the student with an in-depth understanding of the behaviour of materials in their operating environments

LEARNING OUTCOMES

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

- Show knowledge and understanding of strain, fracture, fatigue and corrosion mechanisms and phenomena
- Critically analyse of the environmental degradation of both metals and non-metals and suggest methods of protection
- Critically evaluate mechanical failure modes, including yielding, fracture, fatigue and creep

INDICATIVE CONTENT

- Overview of stress-strain response for common engineering materials, elastic / elastic-homogeneous, plastic/elastic-heterogeneous plastic deformation response
- Plastic yield in pure metals, criteria for yielding
- Strain hardening and flow stress. Anisotropic mechanical response of single crystals, the effects of strain rate and temperature, temperature sensitivity
- Introduction to the finite element method in modelling stress-strain behaviour
- Review of basic alloy strengthening. Solid solution alloying, interstitial and precipitation strengthening techniques
- Micromechanisms of fracture. Ductile, brittle and time dependent creep failure modes. Stress corrosion. Crack initiation under cyclic loading. Static Fracture; theoretical strengths, ductile failure, brittle failure mechanisms, ductile to brittle transitions
- Fracture Mechanics; energy criteria, Griffith criterion, surface energy, crack-tip plasticity, strain energy release rate, evaluation of toughness, G. Stress intensity factors; plane strain and plane stress, crack opening modes, stress concentrations, local yielding. Measurement of fracture toughness, KQ and K1C
- Fatigue mechanisms, initiation and growth, mechanisms of initiation, fatigue fracture surfaces. Stress and strain dependence of fatigue; S-N curves, low and high cycle fatigue, cycle softening and hardening, hysteresis loops. Damage tolerance approach to fatigue; stress intensity range, the Paris relationship, measurement of crack

propagation. Fatigue crack thresholds and the influence of environment; stress corrosion cracking. Crack closure mechanisms; R values, stress reversals.

- Corrosion of ferrous and non-ferrous metals - the cost of corrosion; chemical processes leading to corrosion; corrosion rates. Corrosion of dissimilar metals; galvanic corrosion, the problems of joining. Selective attack; intergranular corrosion, leaching, grain boundary corrosion, differential aeration, pitting, crevice corrosion, corrosion under coatings. Flow induced corrosion; corrosion due to erosion, cavitation and turbulence. Corrosion inhibition; anodic and cathodic inhibitors, kinetics, sacrificial polarisation and sacrificial protection. Corrosion protection by organic and metallic coatings

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	90 minutes	70%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Assessment of Practical Work	1500	30%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

EA1b, P2, G1

INDICATIVE READING LIST

Module Code	ACMA5004	
Module Title	Materials in Service	
Classification	Reading List entry	Electronic*
Essential	Dowling, N. E., Mechanical Behaviour of Materials: Engineering Methods for Deformation, Fracture and Fatigue, 5 th Edition (Pearson Education, 2018)	☐
Essential	Anderson T.L., Fracture Mechanics: Fundamentals and Applications, 4 th Edition (CRC Press, 2017)	☐
Essential	Jones, D.R.H., Ashby, M.F., Engineering Materials 1: An Introduction to Properties, Applications and Design, 5 th Edition (Butterworth-Heinemann, 2018)	☐
Further	Ashby, M.F., Materials Selection in Mechanical Design, 5 th Edition (Butterworth-Heinemann, 2016)	☐
Further	Roberge, P. R., Corrosion Engineering: Principles and Practice (McGraw Hill, 2008)	☐
Further	Suresh, S., Fatigue of Materials (Cambridge University Press, 1998)	☐
Further	Hosford, W. F. and Cadell, R. M., Metal Forming: Mechanics and Metallurgy (Cambridge University Press, 2007)	☐

Module Code	ACMA5005
Title	Six Sigma Green Belt ACMA5005
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

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

LEARNING OUTCOMES

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

- To utilise a range of tools and techniques when applying the six sigma DMAIC methodology to a chosen problem
- To undertake a Six Sigma Green Belt project

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Examination	2 hours	100%

Assessment Summary

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

AHEP 3 Version 3 Outcomes to be met:

P2, P6, P7, P8, G1

INDICATIVE READING LIST

Module Code	ACMA5005	
Module Title	Six Sigma Green Belt	
Classification	Reading List entry	Electronic*
Essential	Pyzdek, T (2018) The Six Sigma Handbook, 5 th Edition, McGraw Hill Education, United States	☐
Essential	Muroe, A (2007) The Certified Six Sigma Green Belt Handbook, ASQ Quality Press, Milwaukee	☐
Essential	Bicheno, J and Holweg, M (2016) The Lean Toolbox, 5 th Edition, Picsie Books, Buckingham	☐
Further	Dale, B. Bamford, D and Van der Wiele, T (2016) Managing Quality: An Essential Guide and Resource Gateway, 6 th Edition, John Wiley & Sons, Chichester	☐
Further	Russell, R.S (2009) Operations Management, John Wiley & Sons, USA	☐
Further	Trivium (2019) Six Sigma Green Belt Study Guide 2019: Trivium Test Prep	☐
Further	Setter, C (2018) Six Sigma: A Complete Step-by-Step Guide, Council for Six Sigma Certification, Buffalo	☐
Further	Barsalou, M (2014) Root Cause Analysis, Productivity Press, Boca Raton	☐
Further	Sartor, M and Orzes, G (2019) Quality Management: Tools, Methods and Standards, Emerald Publishing Limited, Bingley	☐
Further	Slack, N and Brandon-Jones, A (2019) Operations Management, 9 th Edition, Pearson, Harlow	☐
Further	Stevenson, W (2018) Operations Management, McGraw Hill Education, New York	☐
Further	Computers and Industrial Engineering	☒
Further	European Journal of Operations Research	☒
Further	International Journal of Production Economics	☒
Further	International Journal for Project Management	☒
Further	Journal of Cleaner Production	☒
Further	Journal of Manufacturing Systems	☒
Further	Journal of Operations Management	☒
Further	Journal of Purchasing and Supply Management	☒
Further	Operations Research Perspectives	☒
Further	Reliability Engineering and System Safety	☒
Further	www.quality.org	☒
Further	www.asp.org	☒
Further	www.isixsigma.com	☒
Further	www.cips.org	☒

Module Code	ACEA5006
Title	Stress Analysis & Dynamics ACEA5006
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- This module advances students' knowledge of both 2D and 3D CAD drafting and solid modelling and their understanding of the engineering design process in conjunction with the principles of stress analysis.

LEARNING OUTCOMES

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

- Solve, analyse and simulate the behaviour of dynamic mechanical systems using traditional analytical techniques and computer-based simulation.
- Show cognitive skills with respect to the formulation and modelling of real engineering problems and applying mathematical methods of analysis and applying appropriate theoretical and practical methods in problem formulation and decision-making, interpreting experimental results.

INDICATIVE CONTENT

- Introduction to Dynamics
- Kinematics of Particles
- Kinetics of Systems of Particles
- Dynamics of Rigid Bodies
- Resultant accelerations and forces of rotating Rigid Bodies
- Effect of friction on dynamic systems
- Vibration and Time Response
- Measurement system elements
- System modelling and analysis
- Control Strategies
- Mathematical models of open and closed loop systems
- Block diagrams, signal flow diagrams and fundamentals of transfer functions
- Dynamic response of systems and introduction to system stability
- Complex stress including:
 - Principal planes and principal stresses;
 - Construction and interpretation of Mohr's circle;

- The slope and deflection of beams - Macaulay's method and principle of superposition.
- Application in thick and thin walled pressure vessels.
- Numerical methods and MatLab

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	2500 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2hr	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

INDICATIVE READING LIST

Module Code	ACEA5006	
Module Title	Stress Analysis & Dynamics	
Classification	Reading List entry	Electronic*
Essential	Hearn, E.J. <i>Mechanics of Materials, vols. 1 & 2</i> , Butterworth-Heinemann, 1997	☐
Essential	Meriam, J. L., Kraige, L. G. and Bolton, J.N., <i>Engineering Mechanics: Dynamics</i> , 8 th Ed. SI Version (John Wiley & Sons, 2015)	☐
Essential	Bird, O.J. & Ross, C.T.F., <i>Mechanical Engineering Principles</i> , 2 nd Ed. (Routledge, 2012)	☐
Further	Bolton, W., <i>Engineering Science</i> , 5 th Ed. (Oxford: Elsevier Newnes, 2006)	☐
Further	Science Direct (https://www.sciencedirect.com/)	☒

Module Code	ACMA5006
Title	Structure and Properties of Materials ACMA5006
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To enable the student to analyse structure-property relationships in materials and predict behaviour for given structures

LEARNING OUTCOMES

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

- Knowledge and understanding of the structure of crystalline and non-crystalline materials
- Analytical skills in the application of appropriate laws to determine phase composition and both equilibrium and non-equilibrium structures and corresponding properties
- An in-depth understanding of the role of crystal defects in the behaviour of crystalline materials at both the microscopic and macroscopic level

INDICATIVE CONTENT

- The different structural aspects that control the behaviour of materials. The equilibrium state of a metallic material, the concept of metastable states. The types of phase found in microstructures
- Phase transformations; heterogeneous and homogeneous transformations. The growth stage in heterogeneous transformations. Liquid-solid phase transformations; Classical thermodynamic models of homogeneous and heterogeneous nucleation, the influence of undercooling on nucleation
- Solidification and grain structure evolution. Microstructures of solid solution alloys
- Phase diagram for isomorphous alloy system. The Lever Rule and Gibbs Phase Rule.
- Equilibrium and nonequilibrium. Solidification of alloys in a simple eutectic phase diagram. Peritectic reactions
- Solid-state phase transformations and microstructures. Types of interface
- Growth laws for transformations; TTT curves
- Deformation. Restoration processes including recrystallisation
- Phase transformations in plain carbon steels; the iron-cementite phase diagram; the influence of cooling rate
- Crystal Structures - vector algebra and basic crystallography. General rules governing the crystal structures of the elements. Ionic structures. Solid solutions; interstitial and substitutional solid solutions. Polymer crystal structures. Ceramic crystals

- Crystal Defects - Introduction to imperfections in crystals; point and linear defects, vacancies, the concept of dislocation. Dislocation movement, origins and multiplication. Stress field of dislocations; energy of a dislocation. Dislocation reactions. Dislocations and slip in fcc and bcc metals
- Introduction to polymeric materials - chain structure of polymers; thermoplastics and thermosets and associated properties. Polymerisation methods and control of structure. Types of thermoplastics: amorphous, semi-crystalline and copolymers. The importance of additives, including fillers, processing aids and UV stabilisers.

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	90 minutes	70%

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Coursework	1500 words	30%

Assessment Summary

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

AHEP 3 Version 3 Outcomes to be met:
SM1b, SM1m, P4i, P4, G1

INDICATIVE READING LIST

Module Code	ACMA5006	
Module Title	Structure and Properties of Materials	
Classification	Reading List entry	Electronic*
Essential	Callister's Materials Science and Engineering 10 th edition. WD Callister and DG Rethwisch 2014	☒
Essential	Smallman, R. E. and Ngan, A. H. W., Physical Metallurgy and Advanced Materials (Butterworth-Heinemann, 2007)	☒
Essential	Schrader, G.F. and Elshennawy, A. K., Manufacturing Processes and Materials (Society of Manufacturing Engineers 2000)	☒
Further	Abaschian, R., Physical Metallurgy Principles (Nelson Engineering. 2009)	☒
Further	Hosford, W. F., Physical Metallurgy (CRC Press, 2009)	☐
Further	Ashby, M. and Jones, D.R.H., Engineering Materials: An Introduction to Microstructure, Processing and Design (Butterworth-Heinemann 1998)	☐

Module Code	ACHA5007
Title	Thermofluid Mechanics ACHA5007
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Assessment of practical work	2500 words	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, EA1b, P3, G1

INDICATIVE READING LIST

Module Code	ACHA5007	
Module Title	Thermofluid Mechanics	
Classification	Reading List entry	Electronic*
Essential	Cengel, Y., Boles, M., Thermodynamics: An Engineering Approach, 9 th Edition (McGraw-Hill Education, 2018)	☐
Essential	Nise, N.S. Control Systems Engineering, 8 th Edition (John Wiley & Sons, 2019)	☐
Essential	Dorf, R.C., Bishop, R.H., Modern Control Systems, 13 th Edition (Pearson, 2017)	☐
Essential	DiStefano, J.J., Stubberud A.R., Williams, I.J., Schaum's Outline of Feedback and Control Systems, 3 rd Edition. (McGraw-Hill Education, 2013)	☐
Further	Weigand, B., Analytical Methods for Heat Transfer and Fluid Flow Problems, 2 nd Edition (Springer, 2015)	☐
Further	Baskharone, E. A., Thermal Science (McGraw Hill, 2012)	☐
Further	Douglas, J.F., Gasiorek, J., Swaffield, J., Fluid Mechanics, 6 th Edition (Prentice Hall, 2011)	
Further	Spakovszky, Z.S., Thermodynamics & Propulsion, MIT Course 2008-2009, viewed 2019 http://web.mit.edu/16.unified/www/FALL/thermodynamics/	☒
Further	Krieth, F. and Bohn, M. S., Principles of Heat Transfer (Brooks/Cole, 2001)	☐
Further	Rogers, G., Mayhew, Y., Engineering Thermodynamics: Work and Heat Transfer, 4 th Edition (Longman Scientific, 1992)	☐

Module Code	ACHA5008
Title	Thermofluids and Control ACHA5008
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

System analysis and response to test inputs. Performance specifications for second order systems.

- Fundamentals of transfer functions – s-plane analysis. Simple transfer function analysis. Transient response to 1st & 2nd order systems from transfer functions. Feedback and closed-loop systems & transfer functions. Proportional, integral & differential (PID) control. Introduction to system stability and stability criteria.
- Pneumatic & hydraulic power and control systems – design and analysis of simple power transmission systems utilising air and fluid power, and the control of these systems.
- Current technologies – overview of: PLCs, digital control, intelligent systems, distributed measurement and/or control systems.

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

SM1b, EA1b, EA3b

INDICATIVE READING LIST

Module Code	ACHA5008	
Module Title	Thermofluids and Control	
Classification	Reading List entry	Electronic*
Essential	Cengel, Y., Boles, M., Thermodynamics: An Engineering Approach, 9 th Edition (McGraw-Hill Education, 2018)	☐
Essential	Nise, N.S. Control Systems Engineering, 8 th Edition (John Wiley & Sons, 2019)	☐
Essential	Dorf, R.C., Bishop, R.H., Modern Control Systems, 13 th Edition (Pearson, 2017)	☐
Essential	DiStefano, J.J., Stubberud A.R., Williams, I.J., Schaum's Outline of Feedback and Control Systems, 3 rd Edition. (McGraw-Hill Education, 2013)	☐
Further	Weigand, B., Analytical Methods for Heat Transfer and Fluid Flow Problems, 2 nd Edition (Springer, 2015)	☐
Further	Baskharone, E. A., Thermal Science (McGraw Hill, 2012)	☐
Further	Douglas, J.F., Gasiorek, J., Swaffield, J., Fluid Mechanics, 6 th Edition (Prentice Hall, 2011)	
Further	Krieth, F. and Bohn, M. S., Principles of Heat Transfer (Brooks/Cole, 2001)	☐

Module Code	
Title	Control and Automation
Date	24/04/2020
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Coursework	2500 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

INDICATIVE READING LIST

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

Level 6

Module Code	ACMA6000
Title	Advanced Processes & Materials ACMA6000
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To enable the student to gain a critical understanding of the principles and potential applications of a range of advanced engineering processes and materials

LEARNING OUTCOMES

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

- Critically analyse the structure-property relationships and behaviour of a range of advanced engineering materials and manufacturing processes
- Critically appraise the potential for application of a range of advanced materials and processes in typical engineering applications, gaining an understanding of the development of new sustainable materials for specific applications

INDICATIVE CONTENT

- Additive Manufacturing
- Non-traditional machining and thermal cutting processes. (Ultrasonic machining, Electro-chemical machining, electric discharge machining and chemical machining)
- Applications of lasers; laser cutting, laser welding, marking, drilling, laser surface treatment and laser bending. Including Health & Safety principles in the use of lasers
- Modern abrasive processes, ultrasonic machining, abrasive water jet cutting, magnetic abrasive machining
- Non-traditional methods of welding and defect repair: Pulsed laser deposition, Friction stir welding, Laser cladding Thermal spray, Plasma coating, Plasma arc welding
- Semiconductors
- Biomaterials
- Magnetostrictive materials
- SMA
- Nano-engineered Materials

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
Essay/Presentation	3000 words	50%

Assessment Summary

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

AHEP 3 Version 3 Outcomes to be met:

SM1i, SM1b, SM1m, SM3m, SM4m, EA1b, EA1m, EA6m, D1i, D1, EL2, P4i, P2, P4, G1, G4,

INDICATIVE READING LIST

Module Code	ACMA6000	
Module Title	Advanced Processes & Materials	
Classification	Reading List entry	Electronic*
Essential	Groover, M. P., Principles of Modern Manufacturing - 4 th Edition (John Wiley & Sons, 2011)	☒
Essential	I. Gibson (Ian), D. W. Rosen (David W.), B. Stucker (Brent) Additive manufacturing technologies: 3D printing, rapid prototyping and direct digital manufacturing Second edition. New York ; London : Springer 2015	☒
Essential	Callister, W. D.; Rethwisch, D. G., Materials Science and Engineering - 9th Edition (Wiley, 2014)	☒
Further	Understanding additive manufacturing: rapid prototyping : rapid tooling : rapid manufacturing Andreas. Gebhardt Cincinnati, Ohio : Hanser Publications 2011	☐
Further	Kalpakjian, S. and Schmid, S., Manufacturing, Engineering and Technology (Pearson, 2013)	☐
Further	Additive Manufacturing 3D Printing for Prototyping and Manufacturing Andreas Gebhardt Jan-Steffen Hötter Hanser Publishers Munich 2016 ISBN: 978-1-56990-582-1 E-Book ISBN: 978-1-56990-583-8	☐
Further	Manufacturing Process Selection Handbook K. G. Swift Department of Engineering, University of Hull J. D. Booker Department of Mechanical Engineering, University of Bristol Butterworth-Heinemann (Elsevier) Oxford 2013 ISBN: 978-0-08-099360-7	
Further	Karr, S. and Gill, A., Exploring Advanced Manufacturing Technologies (Industrial Press, 2003)	☐
Further	Ion, J., Laser Processing of Engineering Material: Principles, Procedure and Industrial Application (Elsevier Butterworth-Heinemann, 2006)	☐
Further	Steen, W. M. and Watkins, K., Laser Materials Processing (Springer-Verlag, 2003)	☐
Further	Groover's Principles of Modern Manufacturing – 18 Nov 2016 by Mikell P. Groover	☐
Further	Journal of Manufacturing Processes - The Society of Manufacturing Engineers (SME)	☐
Further	International Journal of Manufacturing Research	☐
Further	International Journal of Advanced Manufacturing Technology Proceedings of the IMEChE	☐

Module Code	ACHA6000
Title	Advanced Thermofluid Mechanics ACHA6000
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To enable the student to apply principles of heat transfer and fluid flow to the design and critical analysis of heat exchangers and the application of extended surfaces for enhancing heat transfer
- To extend the student's understanding of heat transfer by employing numerical techniques to evaluate the thermodynamic performance of heat exchangers

LEARNING OUTCOMES

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

- Demonstrate an ability to analyse and design various industrial heat exchanger configurations and critique heat exchanger design methodologies
- Design and analyse optimum extended surface configurations for improved heat transfer performance and apply computational tools to a design solution of a heat exchanger and optimise the performance

INDICATIVE CONTENT

- Consolidation of fundamental principles of fluid flow and heat transfer
- Basics of heat exchanger design – configuration and types
- Heat exchanger design methodologies – overall heat transfer coefficient, Log Mean Temperature Difference, effectiveness-NTU methods
- Limitations of design methods
- Fouling factor – effects on thermal resistance
- Extended surfaces – types and efficiency measures, contact resistance
- Numerical design and optimisation of heat exchanger

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	2500 words	40%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	60%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, EA1b, EA2, P3, G1

INDICATIVE READING LIST

Module Code	ACHA6000	
Module Title	Advanced Thermofluid Mechanics	
Classification	Reading List entry	Electronic*
Essential	Holman, J.P., Heat Transfer, 10 th Ed. – International Edition (London: McGraw-Hill, 2010)	☐
Essential	Rogers, G. and Mayhew, Y.R., Engineering Thermodynamics: work & heat transfer, 4 th Ed. (Harlow: Pearson Prentice Hall, 1992)	☐
Essential	Webb, R.L. and Kim, N-H., Principles of Enhanced Heat Transfer (Taylor & Francis, 2005)	☒
Further	Bolton, W., Engineering Science, 6 th Ed. (Abingdon: Routledge, 2015)	☐
Further	Moran, M.J. and Shapiro, H.N., Fundamentals of Engineering Thermodynamics, 6 th Ed., SI Version (John Wiley & Sons Inc., 2010)	☐
Further	Bergman, T.L., Lavine, A.S., Incropera, F.P. and DeWitt, D.P., Fundamentals of Heat and Mass Transfer, 8 th Edition (Wiley, 2017)	☐
Further	Science Direct: www.sciencedirect.com	☒

Module Code	ACEA6002
Title	Computational Methods ACEA6002
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To provide the student with the necessary skills required to apply computer systems and simulations to model engineering problems

LEARNING OUTCOMES

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

- show detailed knowledge of the usage of suitable analysis packages for specific problems and competence in the application of the packages studied to specific engineering problems
- demonstrate subject specific skills and the ability to successfully validate and critically evaluate CAE results and cognitive skills in the formulation and numerical solution of a problem within the chosen engineering specialism

INDICATIVE CONTENT

- Programming methodology for computational methods
- Partial differential equations: finite difference methods
- Matlab / SciLAB : Allows use of numerical modelling for a variety of mathematical and engineering specific problems
- Solidworks / NX8.5 : Builds on Modelling and FEA skills introduced in Level 5 and allows students to explore more complex simulation situations such as vibrational or thermal analysis
- Genesis : Allows an FEM optimisation methodology to be applied to specific engineering problems. Optimisation techniques, topology, topography, topometry, sizing optimisation, fibre orientation and lay-up optimisation in composite materials
- Fluent: Allows the simulation and validation of 2D and 3D Computational fluid dynamics problems. HPC parallelisation of ANSYS solvers, CFD theory and practice, Higher order meshing including meshing theory and Multi-physics (Fluid-structure interaction) modelling will be introduced
- 2D Data Acquisition Analysis and Programming : Develops an advanced programming skill in the 2D software environment for the analysis and development of the competition motorcycle

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 assignment	3000 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written assignment	3000 words	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, EA2, EA3b, D3b, P3, P8, G1

INDICATIVE READING LIST

Module Code	ACEA6002	
Module Title	Computational Methods	
Classification	Reading List entry	Electronic*
Essential	Langtangen H.P., Linge, S., Finite Difference Computing with PDEs: A Modern Software Approach (Springer, 2017)	☐
Essential	Mazumder, S., Numerical Methods for Partial Differential Equations: Finite Difference and Finite Volume Methods (Academic Press, 2015)	☐
Essential	Croft, D.R., Lilley, D.G., Heat Transfer Calculations Using Finite Difference Equations (Elsevier Science & Technology, 1977)	☐
Essential	Smith, G.D., Numerical Solution of Partial Differential Equations: Finite Difference Methods, 3 rd Edition (Oxford University Press, 1986)	☐
Further	Hunt, B.R., Lipsman, R.L, Rosenberg, J., A Guide to Matlab, 2 nd Edition (Cambridge University Press, 2006)	☒
Further	Evans, G., Numerical Methods for Partial Differential Equations (Springer, 1999)	☐
Further	Spiegel, M.R., Schaum's Outline of Calculus of Finite Differences and Difference Equations, 3 rd Edition (McGraw-Hill, 1971)	☐
Further	Versteeg, H. K. and Malalasekera, W., An Introduction to Computational Fluid Dynamics: The Finite Volume Method (Longman Scientific & Technical, 1995)	☐
Further	Ferziger, J. H. and Perić, M., Computational Methods for Fluid Dynamics (Springer, 2002)	☐
Further	MacDonald, B. J., Practical Stress Analysis with Finite Elements, Glasnevin Publishing (2007)	☐
Further	McBeath, S., Competition Car Aerodynamics (Haynes, 2011)	☐
Further	Katz, J., Race Car Aerodynamics: Designing for Speed (Robert Bentley, 1995)	☐
Further	Barnard, R. H., Road Vehicle Aerodynamic Design: An Introduction (Mechaero, 2001)	☐
Further	Vanderplaats, G. N., Multidiscipline Design Optimisations (VR&D, 2007)	☐
Further	Bernoulli Aerodynamics International, Racecar Graphic (2006)	☐

Module Code	ACMA6001
Title	Control Technology ACMA6001
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	Dynamics Control & Instrumentation

AIM(S)

- To develop analytical skills in predicting the behaviour of feedback control systems and to apply that ability in the design and implementation of industrial control systems.
- Acquire and develop an understanding of the principles and practices of fluid power systems in the operation and control of mechanical and manufacturing systems and devices.

LEARNING OUTCOMES

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

- Analysis of feedback systems in both the time and frequency domains and design PLC systems to satisfy a control specification.
- Critique fluid power (pneumatics and hydraulics) as a medium for the actuation and control of mechanical systems. Analyse and calculate the operational parameters

INDICATIVE CONTENT

- Block diagrams, signal flow diagrams and transfer functions.
- Analysis in the time domain (root locus, Routh stability, transient performance).
- Analysis in the frequency domain (Nyquist diagrams, Nichol's chart, Bode diagrams) and frequency testing.
- PLC ladder diagrams.
- Robotics and kinematics.
- Fluid power components: hydraulic pumps, motors, actuators and valve systems; air
- Compressors and pneumatic equipment. Fluid conditioning considerations.
- Circuit diagrams - CETOP symbolic representation.
- Pump motor hydraulic drives; DCV controlled cylinders and motors; proportional control valves; metered and pressure compensated flow; power, energy and efficiency considerations.
- Energy storage: pneumatic and hydraulic reservoir/ accumulator systems, continuous and intermittent operating systems; safe working practices.

- Calculate flow rates, pressures, loads, motions, characteristics - associated with fluid power circuits/systems, and correspondingly select components and design appropriate circuits.

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 assignment	3000 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Written assignment	3000 words	50%

Assessment Summary

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

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

INDICATIVE READING LIST

Module Code	ACMA6001	
Module Title	Control Technology	
Classification	Reading List entry	Electronic*
Essential	Nise, N.S., Control Systems Engineering - 7 th Edition (John Wiley & Sons, 2013)	☐
Essential	Parr, A., Hydraulic and Pneumatics: A Technician's and Engineer's Guide, 3 rd Edition (Butterworth-Heinemann, 2011)	☒
Further	Khaled, N., Pattel, B., Practical Design and Application of Model Predictive Control: MPC for Matlab and Simulink Users (Butterworth-Heinemann, 2018)	☐
Further	Skinner, S., Cuthbert, M., An Introduction to Practical Hydraulic System Maintenance: A Fluid Power Technician's Guide (Webtec Products Ltd, 2018)	☐
Further	Bolton, W., Programmable Logic Controllers, 6 th Edition (Newnes, 2015)	☒
Further	Janardan, P.J. & Vishnu, P., Instrumentation and Process Control (New Delhi: I.K. International Publishing, 2010)	☐

Module Code	ACEA6003
Title	Environmental Pollution Control ACEA6003
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To enable students to understand and explain the principles of environmental pollution control and be able to apply engineering solutions and technologies to control or eliminate pollution

LEARNING OUTCOMES

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

- in-depth knowledge and understanding of environmental pollution control in relation to noise, air water and land pollution
- critical evaluation of a range of technologies from an engineering perspective that are available to control pollution and financial, operational and economic considerations when selecting suitable pollution control options

INDICATIVE CONTENT

- Control of emissions to air and the range of technologies utilised to manage the impacts of air pollution gaseous emission control
- To perform noise assessments, calculate noise exposure and consider the options available to control the effects of noise pollution
- Water treatment principles and emerging methods of water treatment. Wastewater and sewage treatment processes and pollution control measures
- Economics of pollution control
- Legislation relating to air, noise and water pollution
- Recycling of materials

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	3000 words	50%

Assessment Component 2

☒ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

Assessment Summary

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

AHEP 3 Version 3 Outcomes to be met:
SM3b, EA1b, EA2, EA4b, D2, D4, D6, EL4, P4, P8

INDICATIVE READING LIST

Module Code	ACEA6003	
Module Title	Environmental Pollution Control	
Classification	Reading List entry	Electronic*
Essential	Hill, M., Understanding Environmental Pollution - 2 nd Edition (Cambridge University Press, 2007)	☐
Essential	Mihelic, J. and Zimmermann, J. B., Environmental Engineering: Fundamentals, Sustainability, Design (Wiley, 2009)	☐
Further	Davis, M. and Cornwell, D., Environmental Engineering - 4 th Edition (McGraw Hill, 2008)	☐
Further	Jacobson, M., Air Pollution and Global Warming: History, Science and Solutions - 2 nd Edition (Cambridge University Press, 2012)	☐
Further	Tchobanoglous, G., Burton, F. and Stensel, D., Wastewater Engineering: Treatment and Reuse - 5 th Edition (McGraw Hill, 2013)	☐
Further	Bies, D. A. and Hansen, C. H., Engineering Noise Control: Theory and Practice - 4 th Edition (CRC Press, 2009)	☐
Further	Crawford, R. and Crawford, D., Bioremediation: Principles and Applications (Biotechnology Research) (Cambridge University Press, 2005)	☐
Further	Davis, M., Water and Wastewater Engineering (McGraw Hill, 2010)	☐
Further	Fender, J. and Tjell, C. J., Air Pollution from a Local to a Global Perspective (RSC Publishing, 2009)	☐
Further	Hess-Kosa, K., Indoor Air Quality: The Latest Sampling and Analytical Methods - 2 nd Edition (CRC Press, 2011)	☐
Further	Peters, R., Smith, B. and Hollins, M., Acoustics and Noise Control - 3 rd Edition (Routledge, 2011)	☐
Further	Phalen, R. F. and Phalen, R. N., Introduction to Air Pollution Science (Jones and Barlett, 2011)	☐
Further	Riffat, R., Fundamentals of Wastewater Treatment and Engineering (CRC Press, 2012)	☐
Further	Vallero, D., Fundamentals of Air Pollution - 4 th Edition (Elsevier, 2008)	☐
Further	Journal of Environmental Engineering	☐
Further	Journal of Cleaner Production	☐
Further	Resources Conservation and Recycling	☐
Further	Applied Acoustics	☐
Further	Journal of Sound and Vibration	☐
Further	Environmental Impact Assessment Review	☐

Further	Journal of Environmental Sciences	☐
Further	Water Research	☐
Further	Monitoring Water Quality	☐
Further	Marine Pollution Bulletin	☐
Further	Science of The Total Environment	☐
Further	Journal of Hazardous Materials	☐
Further	Environmental Pollution	☐
Further	Atmospheric Environment	☐
Further	www.carbontrust.com	☒
Further	www.defra.gov.uk	☒
Further	www.environment-agency.gov.uk	☒
Further	www.ciwem.co.uk	☒
Further	www.ciwem.org	☒
Further	www.water-pollution.org.uk	☒
Further	www.epa.gov	☒
Further	www.springer.com	☒

Module Code	ACEA6004
Title	Major Project ACEA6004
Date	24/04/2020
Level	6
Credits	40
Pre-Requisites	None

AIM(S)

- To develop the innovative and creative skills of the student within the field of the engineering specialism being studied

LEARNING OUTCOMES

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

- demonstrate intellectual skills in: the identification and formulation of a problem within the chosen engineering specialism; the application of an appropriate research methodology for the problem
- demonstrate in-depth knowledge and understanding of the technical aspects of the project and awareness of the economic, social and environmental impact of the project
- show practical skills in conducting the required experimental work to validate any theories and mathematical or computer-based models
- demonstrate transferable skills in technical report writing and the critical evaluation of the work undertaken moving towards independent learning

INDICATIVE CONTENT

- Students will undertake projects which will be innovative, academically demanding and which will require a sound theoretical knowledge. They will be expected to work with the minimum of direct supervision in the process leading to the solution of the identified problem.
- Students will be expected to acquire new knowledge mainly based on concepts previously taught in supporting modules. Issues raised in earlier modules (particularly Group Project), eg, costings, project planning, research methodology, ethics, will be developed as appropriate.
- The project may be formulated through a variety of means - student idea, industrial liaison, staff-student discussion, or a combination of these. Although the ultimate choice of project to be undertaken rests with the student, that choice will not be made without consultation with the Project Director. The identification of the problem to be investigated will ideally be made by the end of level 2 of the programme.
- The normal progression for the execution of the Major Project will be as follows for full-time students:

- **Stage 1**

This is a preliminary outline of the proposed project to allow project viability to be assessed and will be submitted by mid-October. A time and resource requirements project plan will also be formulated. This assessment does not contribute to the final grade but guides the student as to the project feasibility and academic quality.

- **Stage 2**

For this, the preparation and planning stage, the student will research the background to the identified problem by the means most appropriate - literature survey and analysis, market analysis, industrial contact etc. Methods of problem solution will be formulated and evaluated. Areas requiring more in-depth background knowledge will be studied at this stage. The project plan will also be updated.

This stage should be completed by December of the first Semester, when an oral examination will take place. This may take the form of a seminar.(see 'Assessment').

- **Stage 3**

Presentation of the results of the project in the form of:-

- a written report of less than 10 000 words
- an oral examination with accompanying poster, paper or digital media as appropriate.

This stage will be completed by May of the final year.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	15	7.5%
Independent learning	385	92.5%
Placement learning	0	0
TOTAL	400	100%

ASSESSMENT

Assessment Component 1

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Interim Viva / Seminar	12 Minutes	10%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Final Viva	30 Minutes	30%

Assessment Component 3

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Final Dissertation Report & Supporting poster	10,000 words	60%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

SM1b, D3b, D4, D6, EL3b, P1, P2, P4, P8, G2, G3b, G4

SM1i, D3, D4i, EL3i, P1i, P2i, P4i, G3i, G4i

INDICATIVE READING LIST

Module Code	ACEA6004	
Module Title	Major Project	
Classification	Reading List entry	Electronic*
Essential	Lock, Dennis. Project Management. 9th ed. Aldershot: Gower, 2007. Print.	☒
Essential	Maylor, H., Project Management 4th Edition (FT Prentice Hall, 2010)	☐
Further	Seppala, N., Business Ethics and Corporate Social Responsibility (Cengage Learning, 2010)	☐
Further	Masterman, G., Sponsorship – for a Return on Investment Butterworth (Heinemann, 2007)	☐

Module Code	ACMA6002
Title	Manufacturing Systems & Simulation ACMA6002
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To enable the student to evaluate key factors in the design and operation of manufacturing facilities

LEARNING OUTCOMES

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

- Analyse the material and information flows in the manufacturing process using simulation and analytical techniques
- Understand a range of strategies for the improvement and management of production operations

INDICATIVE CONTENT

- Design of manufacturing systems- design methodologies and simulation of manufacturing systems as a tool for design/process improvement
- Lean manufacturing- value stream mapping techniques, 5S, waste reduction, lean tools and techniques
- Materials handling and storage techniques. Analytical analysis of these functions.
- Inventory management- types of inventory, methods for inventory management, ordering considerations
- JIT and MRP systems
- Maintenance management and overall equipment effectiveness
- Environmental issues such as reuse, recycling, managing particular waste streams and principles of pollution 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
Analytical Report	3000 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Examination	2 hours	50%

Assessment Summary

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

AHEP 3 Version 3 outcomes to be met:
SM1b, SM3b, EA1b, EA2, EA3b, D1, D4, D5, P1, P8

INDICATIVE READING LIST

Module Code	ACMA6002	
Module Title	Manufacturing Systems & Simulation	
Classification	Reading List entry	Electronic*
Essential	Muller, M (2019) Essentials of Inventory Management, 3 rd , Edition, Harper Collins	☐
Essential	Reid, D and Sanders, N (2012) Operations Management: An Integrated Approach.5 th Edition, John Wiley and Son	☐
Essential	Slack, N and Brandon-Jones, A (2018) Operations and Process Management: Principles and Practice for Strategic Input, 5 th Edition, Pearson	☐
Further	Womack, JP and Jones, D (2003) Lean Thinking, Free Press	☐
Further	Cudney, E and Kestle, R (2011) Implementing Lean Six Sigma Throughout the Supply Chain, CRC Press	☐
Further	Bucheno, J and Holweg, M (2008) The Lean Toolbox, 5 th Edition, Picisie Books	☐
Further	Hines, P Found, P Griffiths, G and Harrison, R (2011) Staying Lean: Thriving, Not Just Surviving, 2 nd Edition, Productivity Press	☐
Further	Quality World	☐
Further	Quality Progress	☐
Further	International Journal of Production Economics	☒
Further	International Journal of Quality and Reliability Management	☒
Further	International Journal of Quality Science	☒
Further	Total Quality Management	☒
Further	Journal of Operations Management	☒
Further	Process Engineer	☒
Further	www.thecqi.org	☒
Further	www.asq.org	☒
Further	www.emeraldinsight.com	☒
Further	www.isspro.co.uk	☒

Module Code	ACMA6004
Title	Metallurgy of Non-Ferrous Alloys ACMA6004
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To provide the student with an in-depth understanding of the physical metallurgy of non-ferrous metals, their applications and processing technology.

LEARNING OUTCOMES

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

- analytical skills in relation to the behaviour of a range of non-ferrous metals, their strengthening mechanisms; evaluating in terms of microstructure and make predictions about behaviour based on microstructural information
- cognitive skills with respect to the formulation and modelling of real engineering problems for a range of non-ferrous metals related processes and relate to the microstructure of the metal or alloy

:

INDICATIVE CONTENT

- overview of non-ferrous alloys and review of strengthening mechanisms
- aluminium and its alloys – binary and ternary alloy systems
- magnesium and its alloys
- titanium and its alloys
- copper and its alloys
- zinc and its alloys
- nickel and its alloys – nickel base super-alloys, shape memory alloys
- other significant metals – refractory metals
- applications – aerospace, medical, automotive
- emerging non-ferrous metals technology – such as laser processing, metal matrix composites, powder processing of titanium, aluminium alloys for high performance forming operations

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	1800 words	30%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	70%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, P2

INDICATIVE READING LIST

Module Code	ACMA6004	
Module Title	Metallurgy of Non-Ferrous Alloys	
Classification	Reading List entry	Electronic*
Essential	Campbell, F. C., Elements of Metallurgy and Engineering Alloys (ASM International, 2008)	☐
Further	Hosford, W. F., Physical Metallurgy (CRC, 2010)	☐
Further	Lumley R., Fundamentals of Aluminium Metallurgy: Production, Processing and Applications (CRC, 2010)	☐
Further	Porter, D. A., Easterling, K. E. and Sherif, M., Phase Transformations in Metals and Alloys (Taylor & Francis, 2009)	☐
Further	Polmear, I. J., Light Alloys: From Traditional Alloys to Nanocrystals (Butterworth-Heinemann, 2005)	☐
Further	Reed, R. C., The Superalloys: Fundamentals and Applications (Cambridge University Press, 2008)	☐
Further	Sanchez, P. N., Titanium Alloys: Preparation, Properties and Applications (Nova Science Publishers, 2010)	☐

Module Code	ACMA6005
Title	Metallurgy of Steel ACMA6005
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To provide the student with an in-depth understanding of the physical metallurgy of steel and steel processing technology

LEARNING OUTCOMES

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

- analytical skills in relation to the behaviour of a range steels, their strengthening mechanisms; evaluating in terms of microstructure and make predictions about behaviour based on microstructural information
- cognitive skills with respect to the formulation and modelling of real engineering problems for a range of steel related processes and relate to the microstructure of the metal or alloy

INDICATIVE CONTENT

- Phase Transformations: The Iron-carbon phase diagram, Steels and Cast Irons, TTT and CCT diagrams;
- Study of equilibrium and non-equilibrium ferrous transformations: Pearlitic, Bainitic and Martensitic Transformations;
- Effect of alloy additions on steel properties: Martensitic quench, Hardenability issues;
- High Strength Low Alloy Steels, Interstitial Free Steels, Tool Steels, Creep resistant steels, High temperature oxidation resistant steels;
- Stainless Steels: Metallurgy, Fabrication, Properties, Applications (Automotive, Aerospace, Power generation);
- Surface treatment and coating technology for steel products;
- Microstructural characterisation techniques for steel products;
- Surface Analysis Techniques for steel products;
- Applications of Steels – automotive, marine, structural
- Coated products – tinplate, galvanised steel, polymer coatings, Cr/CrO₂ coatings
- Emerging steel technology eg, laser processing, steel nanostructures

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	1800 words	30%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hour	70%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, P2

INDICATIVE READING LIST

Module Code	ACMA6005	
Module Title	Metallurgy of Steel	
Classification	Reading List entry	Electronic*
Essential	Bhadeshia, H. and Honeycombe, R., Steels: Microstructure and Properties, 4 th Edition (Butterworth-Heinemann, 2017)	☐
Essential	Mandal, S.K., Steel Metallurgy: Properties, Specifications and Applications (McGraw Hill, 2014)	☐
Essential	Llewellyn, D. T., Steels: Metallurgy and Applications (Butterworth-Heinemann, 2013)	☐
Further	Porter, D. A., Easterling, K. E. and Sherif, M., Phase Transformations in Metals and Alloys, 3 rd Edition (Routledge, 2009)	☐
Further	Hosford, W. F., Physical Metallurgy (CRC, 2010)	☐
Further	Verhoeven, J. D., Steel Metallurgy for the Non-Metallurgist(ASM International, 2007)	☐
Further	Brandt, D Metallurgy Fundamentals: Ferrous and Non-Ferrous, 5 th Edition Goodheart-Wilcox Publisher	☐
Further	Journal of Manufacturing Processes	☒
Further	Journal of Materials Processing Technology	☒
Further	Surface and Coatings Technology	☒
Further	Additive Technology	☒
Further	Engineering Failure Analysis	☒
Further	Materials Today	☒
Further	Materials Science and Engineering	☒
Further	www.theweldinginstitute.com	☒
Further	www.bindit.org	☒
Further	www.iiwelding.org	☒
Further	www.iso.org	☒
Further	www.iom3.org	☒
Further	www.imeche.org	☒

Module Code	ACMA6007
Title	Plant and Asset Engineering ACMA6007
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To enable students to critically analyse a range of engineering requirements in order to ensure plant equipment runs efficiently and assets are well maintained

LEARNING OUTCOMES

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

- Analyse energy efficiency of equipment and processes; make informed decisions on how energy consumption can be reduced and understand the importance of asset management.
- Analyse equipment maintenance requirements from an engineering and process perspective, in order to ensure it operates efficiently and reduces waste in processes.

INDICATIVE CONTENT

- Compressors- operational requirements, treatment of air, distribution, maintenance requirements, compressed air audit
- Energy efficiency in processes, operations and equipment selection, energy auditing and performance monitoring
- Combined heat and power (CHP) operations
- Asset management maintenance planning, scheduled and breakdown maintenance, TPM, RCM and condition-based monitoring
- Motors and drivers- motor efficiency/rating, variable speed drives, maintenance considerations, rotor balancing, fans and blowers
- Reliability analysis in relation to failure (MTBF MTTR MTTF), systems analysis, redundancy and reliability testing
- Efficiency of burners, flame parameters, calculation of fuel ratios and combustion parameters
- Particulate emissions control

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	48	26
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	3000 words	50%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Examination	2 hours	50%

Assessment Summary

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

AHEP 3 Version 3 Outcomes to be met:

SM1b, EA4b, D1, D4, D5, D6, EL3b, EL4, P1, P4, P6, P7, P8

INDICATIVE READING LIST

Module Code	ACMA6007	
Module Title	Plant and Asset Engineering	
Classification	Reading List entry	Electronic*
Essential	Mobley, K (2004) Maintenance Engineering Handbook 8 th Edition, McGraw Hill	☐
Essential	Tooley, N (2009) Plant and Processes Engineering, Elsevier	☐
Essential	Beggs, C (2010) Energy Management, Supply and Construction, 2 nd Edition, Routledge	☐
Further	Borris, S (2006) Total Productive Maintenance: Proven Strategies and Techniques to Keep Equipment Running, McGraw Hill	☐
Further	Brown (2005) Compressors: Selection and Sizing, 3 rd Edition, Gulf Professional Publishing	☐
Further	Turns, S (2011) An Introduction to Combustion: Concepts and Applications, 3 rd Edition, McGraw Hill	☐
Further	Campbell, J Jardine, A and McGlynn, J (2011) Asset Management Excellence: Optimising Equipment Life Cycle Decisions, 2 nd Edition, CRC Press	☐
Further	Hughes, A and Drury, B (2013) Electric Motors and Drives, 4 th Edition, Newnes	☐
Further	Mowbray, J (1999) Reliability Centred Maintenance, 2 nd Edition, Elsevier	☐
Further	Smith (2007) Reliability, Maintainability and Risk: Practical Methods for Engineers, 8 th Edition, Elsevier	☐
Further	Volk, M (2013) Pump Characteristics and Applications, 3 rd Edition. CRC Press	☐
Further	Energy and Buildings	☒
Further	Energy Conservation and Management	☒
Further	Renewable and Sustainable Energy	☒
Further	Chemical Engineering Journal	☒
Further	Energy Policy	☒
Further	Fuel Processing Technology	☒
Further	International Journal of Production Economics	☒
Further	Reliability Engineering & System Safety	☒
Further	Control Engineering Practice	☒
Further	www.carbontrust.com	☒
Further	www.defra.gov.uk	☒
Further	www.imeche.org	☒
Further	www.combustioninstitute.org	☒
Further	www.chpa.co.uk	☒
Further	www.babcockwanson.co.uk	☒
Further	www.wrap.org.uk	☒
Further	www.energyinst.org	☒
Further	www.breeam.org	☒

Module Code	ACMA6008
Title	Procurement and Negotiation ACMA6008
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

- To provide engineers and operations specialists with a range of skills needed to negotiate requirements and procure goods effectively.

LEARNING OUTCOMES

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

- Understand the importance of the procurement process and the need to manage suppliers effectively
- Plan for negotiations, understand a range of negotiation tactics and be able to understand the importance of negotiation in operations

INDICATIVE CONTENT

- Key approaches to negotiation and the importance of planning for negotiations
- Factors that influence the effectiveness of negotiations – balance of power, relationships and communication
- The procurement process, supplier selection and sourcing, use of a purchasing models and supplier perspective
- Different types of procurement, and conflict management
- Financial considerations in procurement – life cycle costing, total acquisition costing, hiring\leasing and straight buys

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	3000 words	50%

Assessment Component 2

☐ Written exam ☒ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Practical Exercise	3000 words	50%

Assessment Summary

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

AHEP 3 Version 3 outcomes to be met:
D2, EL5, P5, P6, P7, P8

INDICATIVE READING LIST

Module Code	ACMA6008	
Module Title	Procurement and Negotiation	
Classification	Reading List entry	Electronic*
Essential	Van Weele, A (2018) Purchasing and Supply Chain Management, 7 th Edition, Cengage	☐
Essential	Lysons, K and Farrington, B (2016) Procurement and Supply Chain Management, 9 th Edition, Pearson	☐
Essential	Bailey, P Farmer, D Crocker, B Jessop, D and Jones, D (2015) Procurement, Principles and Management, 11 th Edition, Pearson	☐
Further	Booth, C (2010) Strategic Procurement: Organising Suppliers and Supply Chain for Competitive Advantage, Kogan Page	☐
Further	Burt, D Dobler, S and Starling, S (2003) World Class Supply Management, 7 th Edition McGraw Hill	☐
Further	Fells, R (2016) Effective Negotiation: From Research to Results, 3 rd Edition, Cambridge University Press	☐
Further	Lewick, R Barry, B and Saunders, D (2015) Essentials of Negotiation, 6 th Edition, McGraw Hill	☐
Further	European Journal of Purchasing and Supply Management	☒
Further	International Journal of Production Economics	☒
Further	Journal of Business Ethics	☒
Further	Journal of Operations Management	☒
Further	Journal of Production and Operations Management	☒
Further	Journal of Supply Chain Management	☒
Further	www.supplymanagement.com	☒
Further	www.ipscmi.org	☒
Further	www.ism.ws	☒
Further	www.cips.org	☒
Further	www.cilt.org.uk	☒
Further	www.ipsera.org	☒

Module Code	ACEA6005
Title	Structural and Fluid Analysis ACEA6005
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	None

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

- Finite Element Method
 - The role of FEA in the lifecycle
 - Analysis types
 - Overview of FEA and creating an FE model
 - Mesh quality checks
 - 1D v 2D v 3D elements
 - Common issues
- Structural analysis techniques using analytical approaches
 - Theories of elastic failure/yield criteria
 - Elastic instability of axially loaded components – Euler theory. Rankine-Gordon theory.
 - Failure of materials – Fatigue, creep and stress concentrations
 - Measurement of stress – photoelasticity, strain gauges
- Fluid Mechanics
 - Bernoulli's Equation
 - Reynolds Number
 - Boundary layer development
 - Separation
 - Turbulence
 - Euler Equation Derivation
 - Navier-Stokes Equations
 - CFD Process & Approach

- Optimisation techniques
 - Optimisation in the design process
 - What is optimisation?
 - Topology, Topography, Size, Shape and composite optimisation
- Application of commercial software to investigate structural and fluid problems
 - Solidworks : Builds on Modelling and FEA skills introduced in Level 5 and allows students to explore more complex simulation situations such as vibrational or thermal analysis applied to engineering problems
 - Genesis : Allows an FEM optimisation methodology to be applied to specific engineering problems. Optimisation techniques, topology, topography, topometry, sizing optimisation, fibre orientation and lay-up optimisation in composite materials
 - Fluent/HelyxOpenFoam: Allows the simulation and validation of 2D and 3D Computational fluid dynamics problems. CFD theory and practice, parallelisation of solvers, Higher order meshing including meshing theory

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

☐ Written exam
 ☒ Coursework
 ☐ Practical

Mode of assessment	Volume	Weighting
Written assignment	3000 words	50%

Assessment Component 2

☐ Written exam
 ☒ Coursework
 ☐ Practical

Mode of assessment	Volume	Weighting
Written assignment	3000 words	50%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:

SM1b, SM2b, EA1b, EA2, EA3b, D3b, P2, P3, P4, P6, P7, P8

INDICATIVE READING LIST

Module Code	ACEA6005	
Module Title	Structural and Fluid Analysis	
Classification	Reading List entry	Electronic*
Essential	Versteeg, Malalasekera, and Malalasekera, W. An Introduction to Computational Fluid Dynamics: The Finite Volume Method. 2nd ed. Harlow: Pearson Prentice Hall, 2007. Print.	☐
Essential	Hearn, E.J. <i>Mechanics of Materials, vols.1 & 2</i> , Butterworth-Heinemann, 1997	☐
Essential	Ferziger, J. H. and Perić, M., Computational Methods for Fluid Dynamics (Springer, 2002)	☐
Essential	Mac Donald, Bryan J. Practical Stress Analysis with Finite Elements. 2nd ed. Dublin: Glasnevin, 2011. Print.	☐
Further	McBeath, S., Competition Car Aerodynamics (Haynes, 2011)	☐
Further	Katz, J., Race Car Aerodynamics: Designing for Speed (Robert Bentley, 1995)	☐
Further	Barnard, R. H., Road Vehicle Aerodynamic Design: An Introduction (Mechaero, 2001)	☐
Further	Sifakis, Eftychios. and Jernej. Barbic. Finite Element Method Simulation of 3D Deformable Solids. 2016. Synthesis Digital Library of Engineering and Computer Science. Web.	☐
Further	Vanderplaats, G. N., Multidiscipline Design Optimisations (VR&D, 2007)	☐
Further	Bernoulli Aerodynamics International, Racecar Graphic (2006)	☐

Module Code	ACMA6009
Title	Welding Engineering ACMA6009
Date	24/04/2020
Level	6
Credits	20
Pre-Requisites	Introduction to Materials and Manufacturing

AIM(S)

- To provide the student with a critical understanding of a range of welding processes, the microstructures of welded joints in ferrous and non-ferrous alloys and the factors which lead to weld defects.

LEARNING OUTCOMES

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

- An ability to apply physical metallurgy principles to explain the response of ferrous and non-ferrous metals to welding, analyse and interpret the microstructures of welds and evaluate the causes of defects in welds
- An in-depth understanding of a range of processes for welding ferrous and non-ferrous metals and an ability to analyse key process parameters

INDICATIVE CONTENT

- Conventional welding technologies – principles of and equipment for arc welding, plasma arc welding and cutting. Metal transfer in consumable electrode processes. Process / [principles, operation and application of manual metal arc welding. Submerged arc welding. Electroslag welding. Gas metal arc welding. Pressure welding, ultrasonic welding, explosive welding, diffusion bonding. Stud welding / mechanical fasteners. Resistance welding. Oxy-fuel gas welding. Thermal cutting and other edge preparation process. Brazing. Soldering. Preheating.
- Advanced welding processes – laser welding, friction stir welding.
- Design of welded joints.
- Response of materials to welding – structural change, stresses and distortion in welding, weldability of ferrous and non-ferrous alloys. Weld metal and heat affected zones. The effect of the heat input on the thermal profile, and its subsequent effect on the microstructure of both the weld metal and heat affected zones.
- Weld defects.
- Weld cracking – hydrogen, solidification, reheat cracking and lamellar tearing – causes and remedies.
- Corrosion of welds.

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	1800 words	30%

Assessment Component 2

☒ Written exam ☐ Coursework ☐ Practical

Mode of assessment	Volume	Weighting
Exam	2 hours	70%

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, EA1b

INDICATIVE READING LIST

Module Code	ACMA6009	
Module Title	Welding Engineering	
Classification	Reading List entry	Electronic*
Essential	Lippold, J.C., Welding Metallurgy and Weldability (Wiley-Blackwell, 2015)	☐
Essential	Lancaster, J.F., Metallurgy of Welding (Woodhead Publishing, 1999)	☐
Further	Blondeau, R., Metallurgy and Mechanics of Welding (Wiley-Blackwell, 2008)	☐
Further	Timings, R., Fabrication and Welding Engineering (Routledge, 2008)	☐
Further	Kou, S., Welding Metallurgy, 2 nd Edition (John Wiley & Sons, 2002)	☐
Further	Vora, J and Badheka Advances in Welding Technologies for Process Development (CRC Press, 2019)	☒
Further	Schwartz, M Innovations in Materials Manufacturing Fabrication and Environmental Safety, (CRC Press, 2010)	☐
Further	Phillips, D Welding Engineering: An Introduction, (John Wiley & Sons, 2015)	☐
Further	Black, J and Kohser, S DeGarmo's Materials and Processes in Manufacturing, SI Version, 12 th Edition, (Wiley, 2018)	☐
Further	Engineering Failure Analysis	☒
Further	Materials Science and Engineering	☒
Further	Engineering Fracture Mechanics	☒
Further	Journal of Materials Processing Technology	☒
Further	Journal of Manufacturing Systems	☒
Further	Journal of Computational Design and Engineering	☒
Further	Materials Today	☒
Further	Materials & Design	☒
Further	Journal of Manufacturing Processes	☒
Further	www.theweldinginstitute.com	☒
Further	www.bindit.org	☒
Further	www.iwelding.org	☒
Further	www.asq.org	☒
Further	www.iom3.org	☒
Further	www.imeche.org	☒

