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

MODULE DIRECTORY

LEVEL 5

ACADEMIC DISCIPLINE OF ENGINEERING

WALES INSTITUTE OF SCIENCE AND ART

2024-2025

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INTRODUCTION

This Module Directory includes all the modules for Level 5 within the Academic Discipline of Engineering (WISA) in the academic year 2024-2025.

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

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

MODULES

Module Code	ACDA5006
Title	Transducers and Signal Conditioning
Date	13/10/2021
Level	5
Credits	20
Pre-Requisites	None

AIM(S)

- To provide the student with knowledge of various types of transducer and the understanding of their application.
- To provide the student with the skills and understanding of various signal conditioning techniques and their application.

LEARNING OUTCOMES

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

- Demonstrate a knowledge of a wide range of transducers and be able to select an appropriate transducer for a given parameter and scale.
- Analyse and design signal conditioners and be able to apply suitable design techniques to the implementation of a given transducer signal.

INDICATIVE CONTENT

- Transducers / Sensors
  - Thermistors, thermocouples, infrared temperature sensors, light dependant resistors, photo diodes, photo transistors, Optical sensors – beam break / reflective, Hall effect sensors, strain gauges.
- Dynamic transducers
  - Altimeters, accelerometers, gyroscopes.
- Passive signal conditioning
- Active signal conditioning – amplification and attenuation
- Standard operational amplifier configurations 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
Report	2,500 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%**

INDICATIVE READING LIST

Module Code	**ACDA5006**	
Module Title	**Transducers and Signal Conditioning**	
Classification	**Reading List entry**	**Electronic***
Essential	Horowitz, P. and Hill, W. (2015) *The Art of Electronics*, Cambridge: Cambridge University Press	☒
Essential	Sinclair, I. (2014), *Sensors and Transducers* Oxford: Newnes	☐
Further	Wobschall, D. (1987) *Circuit Design for Electronic Instrumentation*, New York: McGraw Hill	☐
Further	Murty, D. V. S. (2011) *Transducers and Instrumentation*, New Delhi: PHI Learning	☒
Further	Patranabis, D. (2011) *Sensors and Transducers*, New Delhi: PHI Learning	☐

Module Code	**ACHA5004**
Title	**Motorcycle Dynamics**
Date	**12/07/2024**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

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

LEARNING OUTCOMES

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

- Demonstrate knowledge and understanding of the processes governing the dynamic behaviour of a motorcycle while in motion including power transmission and braking systems and their influence on vehicle behaviour

- Display subject specific skills in the use of modern data acquisition systems and cognitive skills in the development of basic vehicle simulation models

INDICATIVE CONTENT

- Motorcycle Dynamics
  - Determination the wheel loads of a motorcycle under static and dynamic conditions
  - Tyre performance and control
  - Load transfer under longitudinal acceleration
  - Steady state vehicle balance

- Aerodynamics
  - Principles
  - Aerodynamic devices
  - Influence on vehicle performance

- Transmissions
  - Geared drives and transmissions
  - Matching of engine and transmissions for efficiency or dynamic performance
  - Inertia of rotating bodies, mass equivalent of rotating parts
  - Friction systems: clutches and brakes

- Data acquisition and simulation as a motorcycle performance tool
  - Analysing real dynamic data from controlled tests and full track activities
  - Developing basic motorcycle dynamics simulation model

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM2b, EA1, EA2

Assessment Component 2

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

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

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, EA1, EA3b, EA4b, D3b, P1, P3, P4, P8

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, SM2b, EA1, EA2, EA3b, EA4b, D3b, P1, P3, P4, P8

INDICATIVE READING LIST

Module Code	**ACHA5004**	
Module Title	**Motorcycle Dynamics**	
Classification	**Reading List entry**	**Electronic***
Essential	Cossalter, V., Motorcycle Dynamics, LULU; 2nd ed. edition (2 Oct. 2006)	☐
Further	Bradley, J., The Racing Motorcycle: A Technical Guide for Constructors volumes 1 and 2, (Broadband Leisure Publications, 2003)	☐
Further	Spalding, N., MotoGP Technology 3rd Edition : Phoebus Apollo Publishing Limited, 2017	☐
Further	Foale, T., Motorcycle Handling and Chassis Design (Tony Foale, 2002)	☐
Further	Yi Zheng. Automotive Power Transmissions. (Wiley 2018).	☐

Module Code	**ACHA5009**
Title	**Motorsport Dynamics**
Date	**12/07/2024**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To understand the fundamental processes governing suspension design and specification on the ride and handling characteristics of a motorsport vehicle and the methods available for their analysis

LEARNING OUTCOMES

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

- demonstrate knowledge and understanding of the fundamental factors influencing the handling and performance of motorsport vehicles and simulation as an evaluation tool

- Investigate power transmission and braking systems and their influence on vehicle behaviour

INDICATIVE CONTENT

- Vehicle Dynamics
  - suspension as a kinematic system
  - tyre performance and control
  - bicycle model behaviour
  - load transfer under longitudinal and lateral acceleration
  - steady state vehicle balance

- Aerodynamics
  - Principles
  - Aerodynamic devices
  - Influence on vehicle performance

- Transmissions
  - geared drives and transmissions
  - matching of engine and transmissions for efficiency or dynamic performance
  - inertia of rotating bodies, mass equivalent of rotating parts
  - friction systems: clutches and brakes

- Data acquisition and simulation as a vehicle dynamics performance tool
  - Analysing real dynamic data from controlled tests and full track activities
  - Developing basic vehicle dynamics simulation model

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM2b, EA1b, EA2, EA3b, EA4b, P1

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Assignment of Practical work	2500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM2b, EA1b, EA2, EA3b, EA4b, P1, P3, P4

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, SM2b, EA1b, EA2, EA3b, EA4b, P1, P3, P4

INDICATIVE READING LIST

Module Code	**ACHA5009**	
Module Title	**Motorsport Dynamics**	
Classification	**Reading List entry**	**Electronic***
Essential	Bastow, Donald. Geoffrey. Howard, and John P. Whitehead. *Car Suspension and Handling*. 4th ed. Bury St. Edmunds: Warrendale, Pa.: Professional Engineering; SAE International, 2004. Print.	☐
Essential	Gillespie, T. D. *Fundamentals of Vehicle Dynamics*. Warrendale, Pa.: Society of Automotive Engineers, 1992. Print.	☐
Essential	Hillier V and Coombes, P., Fundamentals of Motor Vehicle Technology (Stanley Thornes, 2004)	☐
Essential	Guiggiani, M., The Science of Vehicle Dynamics 2nd Edition (Springer 2018)	☐
Essential	Milliken, William F., and Milliken, Douglas L. Race Car Vehicle Dynamics. Warrendale, Pa.: Society of Automotive Engineers, 1995. Print.	☐
Essential	Schüetz, Thomas. Aerodynamics of Road Vehicles. Fifth ed. 2016. Print.	☐
Further	Heywood, J., Internal Combustion Engine Fundamentals (McGraw Hill, 1989)	☐
Further	Jacobson, Bengt. Vehicle Dynamics Compendium. 2017. Web.	☒
Further	Pacejka, Hans. *Tire and Vehicle Dynamics*. 2nd ed. Elsevier Science, 2005. Web.	☒
Further	Rowley, W., An Introduction to Race Car Engineering - 3rd Edition (Rowley Race Dynamics, 2005)	☐
Further	Staniforth, A., Competition Car Suspension: A Practical Handbook (Haynes, 2006)	☐
Further	Stone R, Introduction to Internal Combustion Engines (Macmillan 1999)	☐
Further	Yi Zheng. Automotive Power Transmissions. (Wiley 2018).	☐

Module Code	**ACHA5010**
Title	**Alternative Propulsion Systems**
Date	**12/07/2024**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To develop the student's ability to analyse the operating systems required for alternative powertrain technologies and to enable the investigation of powertrain system design for alternative storage and propulsion methods including kinetic energy recovery systems.

LEARNING OUTCOMES

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

- Investigate the systems required for electric and hybrid storage and propulsion systems.
- Evaluate alternative powertrain designs and energy recovery systems.

INDICATIVE CONTENT

- Internal combustion engine operating conditions
- Vehicle operating conditions and duty cycles
- Reversible energy storage principles, including chemical, electrical and mechanical
- Kinetic energy recovery system
- Energy conversion principles
- Electrical Principles
- Electric propulsion systems
- Hybrid systems
- Alternative powertrain operating strategies.

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	2500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM3b, EA1b, EA2, EA4b, D4, EL4, EL6, P2, P4

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM3b, EA1b, EA2, EA4b, EL4, P2

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, SM3b, EA1b, EA2, EA4b, D4, EL4, EL6, P2, P4

INDICATIVE READING LIST

Module Code	**ACHA5010**	
Module Title	**Alternative Propulsion Systems**	
Classification	**Reading List entry**	**Electronic***
Essential	Modern electric, hybrid electric, and fuel cell vehicles: fundamentals, theory, and design. (CRC Press 2018)	☒
Essential	**https://batteryuniversity.com/**	☒
Further	Electric motors and drives, fundamentals, types and applications (Elsevier 2013)	☒
Further	Electric and Hybrid Vehicle Technology International. (UKIP Media and Events Ltd). https://www.electrichybridvehicletechnology.com/	☐
Further	Racecar Engineering – (The Chelsea Magazine Company)	☐
Further	http://www.electricmotorsport.com/	☒
Further	http://www.avt.uk.com/	☒
Further	http://www.fiaformulae.com/	☒
Further	http://www.dft.gov.uk/vca/	☐

Module Code	**ACHA5011**
Title	**Thermodynamics & Combustion**
Date	**12/07/2024**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- Understand the major design principles of the modern Vehicle Powertrain System in terms of its power producing capability, drive-cycle fuel economy and emissions.
- To introduce the student to fundamental thermodynamic theories and their application to automotive vehicle systems

LEARNING OUTCOMES

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

- Validate their understanding of cylinder-head and valve-train design principles and their effects on combustion performance and emissions through analysis, test and measurement, with a focus on efficiency and legislation.
- Utilise the fundamental concepts in thermodynamics to solve problems in automotive applications including internal combustion engines and heat exchangers.

INDICATIVE CONTENT

- Determination of the performance of vehicle systems and emissions
- Practical analysis of power producing components of state-of-the-art engines
- Valve-train design and Camshaft analysis
- Analysis of exhaust and intake manifolds including pulse tuning
- Engine design requirements for both emissions and performance.
- Ideal and real engine cycles
- Heat release mechanisms during combustion introducing the Wiebe function
- Effects of combustion chamber, piston design and compression ratio on combustion characteristics and rate of heat release
- The First Law of Thermodynamics
- The Second Law of Thermodynamics and Cyclic systems.
- Cycle efficiencies, irreversibility and entropy
- Modes of heat transfer: conduction (Fourier's Law); convection – fluid flow, properties and geometric factors. Radiation (Steffan/Boltzmann Equation)

- Fundamentals of heat exchanger design and applications in the automotive 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
Coursework	2500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, EA1b, EA2, D3b, D4, EL1, P2, P3, P5, P8, G1

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Coursework	2500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, EA1b, EA2, D3b, D4, EL4, P2, P8, G1

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, EA1b, EA2, D3b, D4, EL1, EL4, P2, P3, P5, P8, G1

INDICATIVE READING LIST

Module Code	**ACHA5011**	
Module Title	**Thermodynamics & Combustion**	
Classification	**Reading List entry**	**Electronic***
Essential	Heywood, J., Internal Combustion Engine Fundamentals 2ED, McGraw-Hill Education; 2 edition (31 May 2018)	☐
Essential	Thermodynamics: Concepts and Applications, Cambridge University Press; Har/Cdr edition (6 Mar. 2006)	☐
Essential	Bosch - *Bosch Automotive Handbook* 9th Edition (Bosch, 2014)	☐
Essential	Nise, N.S. Control Systems Engineering, 8th Edition (John Wiley & Sons, 2019)	☐
Essential	Cengel, Y., Boles, M., Thermodynamics: An Engineering Approach, 9th Edition (McGraw-Hill Education, 2018)	☐
Further	Dorf, R.C., Bishop, R.H., Modern Control Systems, 13th Edition (Pearson, 2017)	☐
Further	DiStefano, J.J., Stubberud A.R., Williams, I.J., Schaum's Ouline of Feedback and Control Systems, 3rd Edition. (McGraw-Hill Education, 2013)	☐
Further	Hillier V – *Fundamentals of Automotive Electronics,* 6th Edition, (Nelson Thornes, 2012)	☐
Further	Bennick A – *Vehicle Electronics Systems*, (Routledge, 1998)	☐
Further	SAE Journals	☒
Further	IMechE Journal	☒

Module Code	**ACHA5012**
Title	**Engineering Management**
Date	**12/07/2024**
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%

AHEP3 Version 3 outcomes to be met in this assessment:
D1, D2, D5, EL1, EL2, EL3b, EL5, EL6, P5, P7, P11b, G3b

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
D1, D2, EL2, EL3b, EL5, EL6, P5

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
D1, D2, D5, EL1, EL2, EL3b, EL5, EL6, P5, P7, P11b, G3b

INDICATIVE READING LIST

Module Code	ACHA5012	
Module Title	Engineering Management	
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 9th Edition (FT Prentice Hall, 2017)	☐
Further	General Management www.mindtools.com	☒
Further	Sustainable Business http://www.edie.net/index.asp	☒

Module Code	**ACHA5013**
Title	**Automotive Chassis Systems**
Date	**12/07/2024**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

AIM(S)

- To understand the fundamentals of Automotive chassis and transmission systems

LEARNING OUTCOMES

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

- demonstrate knowledge and understanding of the automotive chassis including, body structures, crash worthiness and aerodynamics.

- Investigate power transmission and braking systems and their influence on vehicle behaviour

INDICATIVE CONTENT

- Body Structures design
  - Conceptual design and chassis types
  - Bending, torsion, Longitudinal loads, lateral loads
  - Fatigue
  - Types of BIW
  - Manufacture methods

- Crash worthiness
  - Frontal (ODB and FFB)
  - Side (Barrier, pole and IIHS)
  - Occupant (adult and child)
  - Autonomous Vehicles
  - Pedestrian impact
  - Safety Assist systems

- Aerodynamics
  - Principles
  - Aerodynamic devices
  - Influencing on vehicle performance

- Transmissions and rotating systems
  - geared drives and transmissions
  - matching of engine and transmissions for efficiency or dynamic performance
  - inertia of rotating bodies, mass equivalent of rotating parts
  - friction systems: clutches and brakes

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM2b, EA1b, EA2, EA4b, P1

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Assignment	2500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM2b, EA1b, EA2, EA4b, P1, P2, P4

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, SM2b, EA1b, EA2, EA4b, P1, P2, P4

INDICATIVE READING LIST

Module Code	**ACHA5013**	
Module Title	**Automotive Chassis Systems**	
Classification	**Reading List entry**	**Electronic***
Essential	Motor Vehicle Structures: Concepts and Fundamentals (Brown & Serpento, 2001)	☐
Essential	EuroNCAP website (https://www.euroncap.com/)	☐
Essential	Gillespie, T. D. *Fundamentals of Vehicle Dynamics*. Warrendale, Pa.: Society of Automotive Engineers, 1992. Print.	☐
Essential	Hillier V and Coombes, P., Fundamentals of Motor Vehicle Technology (Stanley Thornes, 2004)	☐
Essential	Schüetz, Thomas. Aerodynamics of Road Vehicles. Fifth ed. 2016. Print.	☐
Further	Yi Zheng. Automotive Power Transmissions. (Wiley 2018).	☐
Further	Jacobson, Bengt. Vehicle Dynamics Compendium. 2017. Web.	☒
Further	Automotive Steel Design Manual (American Iron and Steel institute, 2002)	☐
Further	The Aluminium Automotive Manual (European Aluminium Association, 2013)	☐
Further	Stone R, Introduction to Internal Combustion Engines (Macmillan 1999)	☐

Module Code	**ACHA5014**
Title	**Group Design Project**
Date	**12/07/2024**
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.

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

- 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

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

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Interim Viva	15 minutess	30%

AHEP3 Version 3 outcomes to be met in this assessment:
D1, D2, D3b, D5, D6, EL3b, P1, P2, P4, P8, P11b, G1, G2, G3b, G4

Assessment Component 2

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

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

AHEP3 Version 3 outcomes to be met in this assessment:
D1, D2, D3b, D5, D6, EL3b, P1, P2, P4, P8, P11b, G1, G2, G3b, G4

Assessment Component 3

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

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

AHEP3 Version 3 outcomes to be met in this assessment:
D1, D2, D3b, D5, D6, EL3b, P1, P2, P4, P8, P11b, G1, G2, G3b, G4

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
D1, D2, D3b, D5, D6, EL3b, P1, P2, P4, P8, P11b, G1, G2, G3b, G4

INDICATIVE READING LIST

Module Code	**ACHA5014**	
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	**ACHA5015**
Title	**Stress Analysis & CAE**
Date	**12/07/2024**
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 knowledge and understanding of the use of appropriate design methods in conjunction with advanced features of a 3D CAD system in engineering design. Whilst showing subjective specific skills in the use of computational methods and the principles of stress analysis for the manufacture and appraisal of mechanical components.

- 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

- The design process – introduction to modern CAE techniques, and their impact on the design process.

- Introduction to Finite Element Analysis

- 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.

- Further techniques for component synthesis in 3D CAD systems: eg. Extrusion, revolving, patterning, Boolean operations, parametric methods, lofting and sweep methods, surfacing approaches, assembly modelling and assembly animation.

- 2D CAD drafting, dimensioning and introduction geometric tolerancing.

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 Practical Assessment	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM2b, EA2, EA3b, EA4b, D4, P2, P3, P6, G1

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 Hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
SM1b, SM2b, EA2, EA3b, EA4b, P2

Assessment Summary

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

AHEP3 Version 3 outcomes to be met:
SM1b, SM2b, EA2, EA3b, EA4b, D4, P2, P3, P6, G1

INDICATIVE READING LIST

Module Code	**ACHA5015**	
Module Title	**Stress Analysis & CAE**	
Classification	**Reading List entry**	**Electronic***
Essential	Hearn, E.J. *Mechanics of Materials, vols.1 & 2*, Butterworth-Heinemann, 1997	☐
Essential	K. Lee, *Principles of CAD/CAM/CAE Systems* (Addison Wesley 1999)	☐
Essential	C. McMahon & J Browne *CAD/CAM Principles, Practice & Manufacturing Management* (Prentice Hall 1998)	☐
Essential	Mac Donald, Bryan J. Practical Stress Analysis with Finite Elements. 2nd ed. Dublin: Glasnevin, 2011. Print.	☐
Further	M. Fitzpatrick *Machining and CNC technology* (McGraw-Hill Higher Education 2004	☐
Further	A.D. Dimarogonas, *Machine Design: a CAD Approach* (Wiley 2001)	☐
Further	O. Molloy et al *Design for Manufacturing & Assembly* (Kluwer Academic Publisher	☐
Further	C. Poli, *Design for Manufacturing: a Structured Approach* (Butterworth-Heinemann	☐
Further	Science Direct (https://www.sciencedirect.com/)	☒

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

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

Assessment Component 2

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

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

Assessment Component 3

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

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

Assessment Component 4

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

Mode of assessment	Volume	Weighting
Presentation	15 minutes	25%

Assessment Summary

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

INDICATIVE READING LIST

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

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:**Activity type**	**Hours**	**Percentage**
Scheduled learning	48	24%
Independent learning	152	76%
Placement learning	0	0
TOTAL	**200**	**100%**

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Coursework	2500 words	50%

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

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

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

Assessment Summary

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

INDICATIVE READING LIST

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

Module Code	ACMA5002
Title	Manufacturing Design and Technology
Date	12/07/2024
Level	5
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
EA4b	Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems
D1	Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics
D2	Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards
D4	Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal
D5	Plan and manage the design process, including cost drivers, and evaluate outcomes
EL6	Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques
P3	Ability to apply relevant practical and laboratory skills

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	5,000 words	100%

AHEP3 Version 3 outcomes to be met in this assessment:
EA4b, D1, D2, D4, D5, EL6, P3

Assessment Summary

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

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, 4th 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, 2nd 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	**ACMA5004**
Title	**Materials in Service**
Date	**01/02/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
SM1b	Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies
EA1b	Understanding of engineering principles and the ability to apply them to analyse key engineering processes
P1	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc)
P2	Knowledge of characteristics of particular materials, equipment, processes or products

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	1,500	30%

Assessment Summary

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

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, 5th Edition (Pearson Education, 2018)	☐
Essential	Anderson T.L., Fracture Mechanics: Fundamentals and Applications, 4th Edition (CRC Press, 2017)	☐
Essential	Jones, D.R.H., Ashby, M.F., Engineering Materials 1: An Introduction to Properties, Applications and Design, 5th Edition (Butterworth-Heinemann, 2018)	☐
Further	Ashby, M.F., Materials Selection in Mechanical Design, 5th 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	**ACMA5006**
Title	**Structure and Properties of Materials**
Date	**01/02/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
SM1b	Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies
EA1b	Understanding of engineering principles and the ability to apply them to analyse key engineering processes
P1	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc)
P2	Knowledge of characteristics of particular materials, equipment, processes or products

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
- Demonstrate analytical skills in the application of appropriate laws to determine phase composition and both equilibrium and non-equilibrium structures and corresponding properties
- Demonstrate 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
Written Report	1,500 words	30%

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5006	
Module Title	Structure and Properties of Materials	
Classification	Reading List entry	Electronic*
Essential	Callister, W D and Rethwisch, D G, Callister's Materials Science and Engineering, 10th edition (John Wiley & Sons, 2020)	☒
Essential	Smallman, R. E. and Ngan, A. H. W., Physical Metallurgy and Advanced Materials (Butterworth-Heinemann, 2015)	☒
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	Haidemenopoulos, G., N., Physical Metallurgy Principles and Design (CRC Press. 2018)	☒
Further	Hosford, W. F., Physical Metallurgy (CRC Press, 2009)	☐
Further	Ashby, M. and Jones, D.R.H., Engineering Materials 2: An Introduction to Microstructure and Processing, 4th Edition (Butterworth-Heinemann 2012)	☐
Further	Ashby, M. and Jones, D.R.H., Engineering Materials 1: An Introduction to Properties, Applications and Design, 5th Edition (Butterworth-Heinemann 2019)	☐

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Assignment	2500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
EL1, EL2, EL3b, EI4, EL5, EL6, P5, P6, P7, P11b

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
EL1, EL2, EL3b, EI4, EL5, EL6, P5, P6, P7

Assessment Summary

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

INDICATIVE READING LIST

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

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

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

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

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

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

Assessment Summary

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

INDICATIVE READING LIST

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

Module Code	ACMA5009
Title	Group Project
Date	12/07/2024
Level	5
Credits	20
Pre-Requisites	None

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

AIM(S)

- Provide students with an understanding of 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 enable students 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:

- Design and execute an engineering project using management strategies within time and budget constraints, considering the environment and sustainability.
- Demonstrate 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 minutes	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.

AHEP3 Version 3 outcomes to be met in this assessment:
D6, EL1, EL3b, P1, P4, P11b, G1, G2, G3b, G4

Assessment Component 2

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

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

AHEP3 Version 3 outcomes to be met in this assessment:
D6, EL1, EL3b, P1, P4, P11b, G1, G2, G3b, G4

Assessment Component 3

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

Mode of assessment	Volume	Weighting
Written Project report / A3 report	2,500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
D6, EL1, EL3b, P1, P4, P11b, G1, G2, G3b, G4

ALTERNATIVE ASSESSMENT

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

Mode of assessment	Volume	Weighting
Reflective report	5,000 words	100%

AHEP3 Version 3 outcomes to be met in this assessment:
D6, EL1, EL3b, P1, P4, P11b, G1, G2, G3b, G4

Assessment Summary

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

INDICATIVE READING LIST

Module Code	**ACMA5009**	
Module Title	**Group 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	Blowfield, M., Corporate Social Responsibility (Oxford University Press, 2019)	☐
Further	Masterman, G., Sponsorship – for a Return on Investment Butterworth (Heinemann, 2007)	☐

Module Code	ACMA5010
Title	Stress Analysis and Dynamics
Date	12/07/2024
Level	5
Credits	20
Pre-Requisites	None

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
EA1b	Understanding of engineering principles and the ability to apply them to analyse key engineering processes
EA2	Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques
EA3b	Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action
D3b	Work with information that may be incomplete or uncertain and quantify the effect of this on the design

AIM(S)

- To advance 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:

- 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	2,500 words	50%

AHEP3 Version 3 outcomes to be met in this assessment:
EA1b, EA2, D3b

Assessment Component 2

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

AHEP3 Version 3 outcomes to be met in this assessment:
EA1b, EA2, D3b

Assessment Summary

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

INDICATIVE READING LIST

Module Code	**ACMA5010**	
Module Title	**Stress Analysis and Dynamics**	
Classification	**Reading List entry**	**Electronic***
Essential	Hearn, E.J. *Mechanics of Materials, vols.1 & 2*, Butterworth-Heinemann, 1997	☐
Essential	Meriam, J. L., Kraige, L. G. and Bolton, J.N., Meriam's Engineering Mechanics: Dynamics, 9th Ed. SI Version (John Wiley & Sons, 2020)	☐
Essential	Bird, O.J. & Ross, C.T.F., Mechanical Engineering Principles, 4nd Ed. (Routledge, 2019)	☐
Further	Bolton, W., Engineering Science, 6th Ed. (Routledge, 2015)	☐
Further	Science Direct (https://www.sciencedirect.com/)	☒

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Exam	2 hours	50%

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

Assessment Component 2

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

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

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

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMA5011	
Module Title	Thermofluid Mechanics	
Classification	Reading List entry	Electronic*
Essential	Cengel, Y., Boles, M., Thermodynamics: An Engineering Approach, 9th Edition (McGraw-Hill Education, 2018)	☐
Essential	Nise, N.S. Control Systems Engineering, 8th Edition (John Wiley & Sons, 2019)	☐
Essential	Dorf, R.C., Bishop, R.H., Modern Control Systems, 13th Edition (Pearson, 2017)	☐
Essential	DiStefano, J.J., Stubberud A.R., Williams, I.J., Schaum's Outline of Feedback and Control Systems, 3rd Edition. (McGraw-Hill Education, 2013)	☐
Further	Weigand, B., Analytical Methods for Heat Transfer and Fluid Flow Problems, 2nd Edition (Springer, 2015)	☐
Further	Baskharone, E. A., Thermal Science (McGraw Hill, 2012)	☐
Further	Douglas, J.F., Gasiorek, J., Swaffield, J., Fluid Mechanics, 6yh 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, 4th Edition (Longman Scientific, 1992)	☐

Module Code	**ACMA5012**
Title	**Environmental Engineering and Sustainable Energy**
Date	**01/02/2021**
Level	**5**
Credits	**20**
Pre-Requisites	**None**

Engineering Council AHEP3 Learning Outcomes Assessed in this Module	
SM3b	Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline
EA4b	Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems
D1	Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics
EL4	Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate
P2	Knowledge of characteristics of particular materials, equipment, processes or products

AIM(S)

- Provide students with an understanding of 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%**

INDICATIVE READING LIST

Module Code	**ACMA5012**	
Module Title	**Environmental Engineering and Sustainable Energy**	
Classification	**Reading List entry**	**Electronic***
Essential	Twidell, J and Weir, T (2015) Renewable Energy Resources, 3rd Edition, Routledge	☐
Essential	Peake, S (2017) Renewable Energy: Power for a Sustainable Future, 4th Edition, Oxford University Press	☐
Essential	Mihelic, J and Zimmermann, J (2014) Environmental Engineering Fundamentals and Sustainability, 2nd Edition, John Wiley and Sons	☐
Further	Masters, G and Ela, W (2013) Introduction to Environmental Engineering and Science, 3rd Edition, Pearson	☐
Further	Breeze, P (2019) Power generation Technologies, 3rd Edition, Newnes	☐

Further	Andrews, J and Jelley, N (2017) Energy Science Principles, Technologies and Impacts, 3rd Edition, Oxford University Press	☐
Further	Burton, A Jenkins, N Shape, D and Bossany, E (2011) Wind Energy Handbook, 2nd 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 (2012) Environmental Engineering, 5th 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.ciwm.co.uk	☒
Further	www.ciwem.org	☒
Further	www.water-pollution.org.uk	☒
Further	www.epa.gov	☒

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

AIM(S)

- To analyse and apply forecasting and planning techniques.

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1
(Tick one)

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

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

Assessment Summary

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

INDICATIVE READING LIST

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1
(Tick one)

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

Mode of assessment	Volume	Weighting
Video Presentation	20 minutes	100%

Assessment Summary

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

INDICATIVE READING LIST

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1
(Tick one)

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

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

Assessment Summary

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

INDICATIVE READING LIST

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1
(Tick one)

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

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

Assessment Summary

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

INDICATIVE READING LIST

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

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

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1
(Tick one)

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

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

Assessment Summary

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

INDICATIVE READING LIST

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

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

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

*Only applies to Materials Science programme

AIM(S)

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

LEARNING OUTCOMES

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

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

INDICATIVE CONTENT

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

Study Time Allocation

The study time for the module is divided as follows:

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

ASSESSMENT

Assessment Component 1

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

Mode of assessment	Volume	Weighting
Coursework	5000 words	100%

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

Assessment Summary

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

INDICATIVE READING LIST

Module Code	ACMB5005	
Module Title	Six Sigma Green Belt	
Classification	**Reading List entry**	**Electronic***
Essential	Pyzdek, T (2018) The Six Sigma Handbook, 5th 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, 5th Edition, Picsie Books, Buckingham	☐
Further	Dale, B. Bamford, D and Van der Wiele, T (2016) Managing Quality: An Essential Guide and Resource Gateway, 6th 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, 9th 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	☒