

WM3H1-30 Design for End Customer

26/27

Department

WMG

Level

Undergraduate Level 3

Module leader

Matthew Pitts

Credit value

30

Module duration

42 weeks

Assessment

100% coursework

Study locations

University of Warwick main campus, Coventry Primary

Distance or Online Delivery

Description

Introductory description

This 30CATS module, running throughout the academic year, gives learners an opportunity to apply academic knowledge to real-life scenarios/work-based challenges. The focus of this module is the application of reverse engineering, CAE, product design and manufacturing methodologies to a complex engineering problem.

The first part of the module focuses on application of reverse engineering techniques to create a virtual model of a physical component, working as part of a group. This entails the application of surface capture technologies and CAD tools, identifying issues relating to data quality.

The second part of the module involves the development of the product analysed in part 1 to meet a specified brief. Identifying and applying design practices and CAE tools and techniques, groups will model and implement appropriate design changes. This involves modelling of load cases and material/process selection, along with application of dimensioning and tolerancing concepts. Groups will also develop a project management plan to support efficient delivery of product development outcomes.

The final element of the module is an individual review of the project, reflecting on the chosen design decisions and project management, with reference to quality management and assurance systems and the product lifecycle.

This module is linked with C2, C3, C5, C12, C13, C14, C15, C16, C17, C18 of the AHEP 4.

LO1 – C12, C13

LO2 – C2, C5

LO3 – C3, C13

LO4 – C16, C17

LO5 – C15

LO6 – C17, C18

LO7 – C14

[Module web page](#)

Module aims

The main aim of the module is to provide a platform for the application of knowledge and skills gained throughout the course to date, through a product development exercise.

The module brings together concepts taught in earlier modules, along with additional taught material, to work on a complex engineering problem. The ability to work effectively as an individual and as part of a multifunctional group is key to this module, requiring a high degree of teamwork and communication skills.

In addition, students will also demonstrate their ability to reflect on engineering design and project management decisions applied, appraising both the performance as a group and their contribution as individuals.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

- Reverse Engineering - Surface capture methods
- Reverse Engineering – Geometry recreation
- Computer Aided Machining
- Computer Aided Engineering – Application of CAE modelling techniques (specifically FEA)
- CAE – Model post-processing and analysis
- Interpretation of product requirement specification
- Applied Geometric Dimensioning and Tolerancing
- Measurement Fundamentals
- Measurement Technologies
- Material and manufacturing process selection
- Product Verification
- Reflective Practice in Engineering

Learning outcomes

By the end of the module, students should be able to:

- Create a virtual representation of a physical artefact to support engineering design activities through the application of appropriate reverse engineering methods [AHEP:4 - C12, C13]
- Interpret a customer-defined product specification and implement appropriate design and manufacturing solutions to achieve it [AHEP:4 - C2, C5]
- Model product behaviour through the application of appropriate CAE techniques as part of a product development workflow [AHEP:4 - C3, C13]
- Appraise the ability to work as an individual or a team member to communicate details of complex engineering projects and to achieve shared project objectives [AHEP:4 - C16, C17]
- Identify and apply project management tools to guide product development, mitigating risks and reducing uncertainty [AHEP:4 - C15]
- Reflect on, and retrospectively critique, overall project outcomes, including group and personal contributions [AHEP:4 - C17, C18]
- Discuss the application of Quality Management and Assurance Systems to product development [AHEP:4 - C14]

Indicative reading list

[Reading lists can be found in Talis](#)

[Specific reading list for the module](#)

Subject specific skills

- Translate conceptual ideas or technical requirements into developmental outcomes or operational designs or specifications for systems or components to solve manufacturing challenges such as compliance, technology, technical or physical challenges (S1 in ST0025/ST0027)
- Interpret and produce technical documentation such as schematic and circuit diagrams, engineering drawings or 3D CAD models, simulation models, project plans, engineering reports, test reports, fault reports or data analytics using company documentation systems and guidelines (S4 in ST0025/ST0027)
- Manage assigned projects or programmes of work, taking into account factors such as safety, quality, cost and performance criteria (S6 in ST0025/ST0027)
- Identify resources, such as digital tools or technologies, human, equipment, materials or data, to complete design and development projects or programmes of work (S8 in ST0027, S9 in ST0025)
- Create a project or work programme plan and develop activities in a logical process embedding mechanisms for adapting to changing circumstances or requirements (S9 in ST0027 / S10 in ST0025)
- Demonstrate leadership when undertaking product design, development, modification or update engineering activities (S10 in ST0027)
- Evaluate engineering designs, development or modification options (S13 in ST0027)

Transferable skills

- Critical thinking - Make informed decisions on the value of a range of sources allowing an

evidence based conclusion based on this analysis.

- Problem solving - Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions.
 - Communication - Communicate orally in a clear and sensitive manner which is appropriately varied according to different audiences. Present arguments, knowledge and ideas, in a range of formats.
 - Teamwork and working effectively with others - Operate within, and contribute to, a respectful, supportive and cooperative group climate. Sensitive to the impact of actions on others.
 - Professionalism - Prepared to operate autonomously. Aware of how to be efficient and resilient. Manages priorities and time. Self-motivated, setting and achieving goals, prioritising tasks.
 - Organisational awareness - Understanding of business, government and third sector issues and priorities. Awareness of the responsibilities of organisations in society. Understanding organisational norms of behaviour.
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Study

Study time

Type	Required
Lectures	21 sessions of 1 hour (7%)
Seminars	9 sessions of 1 hour (3%)
Online learning (scheduled sessions)	30 sessions of 1 hour (10%)
Online learning (independent)	10 sessions of 1 hour (3%)
Other activity	10 hours (3%)
Private study	100 hours (33%)
Assessment	120 hours (40%)
Total	300 hours

Private study description

Self-guided study: revision on module contents, solution of additional seminar-type questions, video tutorials and supplementary materials.

Study and use of CAD and simulation software.

Online forum and discussion (asynchronous).

Other activity description

On-line support / consultancy during project work and before assessment.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Assessment component			
Assignment 1 - Group portfolio on reverse engineering	25%	30 hours	No
Group portfolio including design, CAD drawings and a written report detailing the workflow and outcomes of a reverse engineering exercise. Group submissions - typical group size will be 5. Peer-marking will be applied in line with WMG policy.			
Reassessment component			
Assignment 1 Resubmission			Yes (extension)
Individual report detailing the project planning, workflow and outcomes of a reverse engineering exercise, with individual assessment of group performance.			
Assessment component			
Assignment 2 - Group project on modelling and design	50%	60 hours	No
Group portfolio (CAD drawing, CAE model and a written report) on modelling, material selection and design development building on earlier reverse engineering work, including project planning and management, with team project review activity. Group submissions - typical group size will be 5. Peer-marking will be applied in line with WMG policy.			
Reassessment component			
Assignment 2 - Resubmission			Yes (extension)
Individual portfolio (CAD & CAE models and a written report) on modelling and design development, with individual assessment of group performance.			

Assessment component	Weighting	Study time	Eligible for self-certification
Assignment 3 individual reflective report on Assignments 1 and 2 - focusing on process workflow, application of Quality Assurance Systems, project management and on the roles of team members.	25%	30 hours	Yes (extension)

Reassessment component is the same

Feedback on assessment

Formative feedback on Moodle/Vevox quiz activities
Formative feedback given during seminars and revision classes

Written summative group feedback on Assignment 1.
Written summative group feedback on Assignment 2.
Written summative individual feedback on Assignment 3.

Availability

Courses

This module is Core for:

- Year 3 of UWMS-H7C1 Undergraduate Applied Professional Engineering (Manufacturing Engineer)
- Year 3 of DWMS-H7C5 Undergraduate Applied Professional Engineering (Manufacturing Engineer) (Degree Apprenticeship)
- Year 3 of UWMS-H7C4 Undergraduate Applied Professional Engineering (Product Design and Development Engineer)
- Year 3 of DWMS-H7C8 Undergraduate Applied Professional Engineering (Product Design and Development Engineer) (Degree Apprenticeship)