Module Specification

Digital Manufacturing in Aerospace

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Contents

Part 1: Information

Module title: Digital Manufacturing in Aerospace

Module code: UFMF7V-15-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field:

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: Yes

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Digital Manufacturing is a unique attribute of Additive Manufacturing Technologies intertwined with Digital Design Methodologies offering opportunity to design and manufacture of bespoke parts with highly complex features for aerospace and a wide range of other industrial applications.

This module is designed to provide the learners with a detailed knowledge and

practical skill for the development of personalised products and customised solutions.

Features: Not applicable

Educational aims: The aim of this module is to establish the Additive Manufacturing Technologies and Digital Design Methodologies for aerospace applications.

Outline syllabus: The syllabus aims to provide:

Classification and working principles of each Additive Manufacturing (AM) process

Materials employed in each process

AM standards

Benchmarking methods

Design for AM

Process parameters associated to Powder Bed Fusion and Fused Deposition Modelling

Influence of process parameters on final part properties

Part quality issues associated to material reuse

Multi scale modelling approaches

Benefit of modelling and prediction

Implementation of Direct Digital Modelling process chain

Appreciation of Digitization and data format in Digital Manufacturing

Understanding design optimisation tools

Various methods available for post processing and finishing

Digitally Manufactured patterns for Investment Casting

Digital tooling enhanced capabilities of Injection Moulding

Development of modular fixturing system

Part 3: Teaching and learning methods

Teaching and learning methods: The course will be delivered through a combination of scheduled learning activities, such as lectures and tutorials. These sessions will be used to introduce the principles of the topics and the tutorials and course work assignment will be used to further develop these topics and student competence.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Critically evaluate manufacturing technologies, processes and performance for use within aerospace and other industrial sectors (EA2, EA5m, D2, D4, P9m)

MO2 Appropriately apply benchmarking techniques associated to design for manufacture. (SM2m, D5, P2, P8m, P10m)

MO3 Critically evaluate design optimisation tools and approaches in developing complex and functional components. (EA3b, D3b, P3)

MO4 Identify and apply suitable process modelling strategies concerning process efficiency and part quality . (EA1b, D5, G4)

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Computer-based activities = 6 hours

Total = 150

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/7A12AD99-ABAC-35F4-E2EC-42EA90AC0F72.html?lang=en-US&login=1

Part 4: Assessment

Assessment strategy: The assessment model for this module is structured to verify students' competence and demonstrate understanding of digital manufacturing technologies. It also requires students to demonstrate an ability to apply this in a realistic and representative scenario.

The nature of the course work and the requirements for the students to demonstrate competence means that a group based task will be set assessed by a group presentation with individual questions.

The aim of this assignment focuses on the geometric performance evaluation methods used in Additive Manufacturing, particularly focusing on Fused Deposition Modelling (FDM). The knowledge gained from this assignment will enable students to evaluate process performance characteristics including dimensional/geometric accuracy, repeatability, minimum feature size, warpage and distortion, surface roughness, anisotropic mechanical properties and overhang limitations.

A peer review process will be applied to moderate the group mark according to the Department Group Work Policy.

The resit assessment will be the same as the first sit.

Resit deliverable(s) will be scaled appropriately to group size and task complexity

Assessment tasks:

Presentation (First Sit)
Description: Group presentation and individual questions (30 minutes)
Weighting: 100 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO1

Presentation (Resit)
Description: Group presentation and individual questions (30 minutes)

Resit deliverable(s) will be scaled appropriately to group size and task complexity
Weighting: 100 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Aerospace Engineering {Apprenticeship-UCW} [Sep][FT][UCW][4yrs] BEng (Hons) 2020-21

Aerospace Engineering {Apprenticeship-UWE} [Sep][FT][UCW][4yrs] BEng (Hons) 2020-21

Aerospace Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2021-22

Aerospace Engineering [Sep][FT][Frenchay][4yrs] MEng 2021-22

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][4yrs] MEng 2021-22

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][3yrs] BEng (Hons) 2021-22

Aerospace Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2020-21

Aerospace Engineering [Sep][SW][Frenchay][5yrs] MEng 2020-21

Aerospace Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][4yrs] BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][5yrs] MEng 2020-21

Aerospace Engineering with Pilot Studies {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2020-21