Module Specification

Digital Manufacturing and Industry 4.0

Version: 2024-25, v1.0, 15 Jun 2023

Contents

Part 1: Information

Module title: Digital Manufacturing and Industry 4.0

Module code: UFMEX1-15-2

Level: Level 5

For implementation from: 2024-25

UWE credit rating: 15

ECTS credit rating: 7.5

College: College of Arts, Technology and Environment

School: CATE School of Engineering

Partner institutions: None

Field: Engineering, Design and Mathematics

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: The Digital Manufacturing and Industry 4.0 module is designed to provide students with a comprehensive understanding of the principles and technologies behind the Fourth Industrial Revolution and its impact on manufacturing. The module will cover key concepts such as the Internet of Things (IoT), artificial intelligence (AI), and big data analytics, as well as emerging technologies such as 5G and edge computing.

Throughout the module, students will have the opportunity to work on real-world projects and case studies related to digital manufacturing and Industry 4.0, allowing them to apply their knowledge and skills in a practical setting. The module will also include guest lectures from industry experts and visits to manufacturing sites to give students a firsthand look at how these technologies are being used in the real world.

Upon completing the Digital Manufacturing and Industry 4.0 module, students will have a solid foundation of knowledge and skills in the principles and technologies of digital manufacturing and Industry 4.0. They will be well-equipped to pursue careers in this rapidly-growing field and to address the challenges and opportunities presented by the Fourth Industrial Revolution.

Features: Not applicable

Educational aims: The educational aim of the Digital Manufacturing and Industry 4.0 module is to provide students with a comprehensive understanding of the principles and technologies behind the Fourth Industrial Revolution and its impact on manufacturing. Through a combination of lectures, hands-on exercises, and real-world projects, students will learn about key concepts such as the Internet of Things (IoT), artificial intelligence (AI), and big data analytics, as well as emerging technologies such as 5G and edge computing. Upon completing the module, students will be able to identify and analyse the key technologies of Industry 4.0, understand the potential impact of emerging technologies on digital manufacturing, and apply their knowledge and skills to a variety of projects and case studies related to digital manufacturing and Industry 4.0. They will also be well-equipped to pursue careers in this rapidly-growing field and to address the challenges and opportunities presented by the Fourth Industrial Revolution.

Outline syllabus: I. Introduction to Digital Manufacturing and Industry 4.0

- Basics of the Fourth Industrial Revolution and its impact on manufacturing
- Key technologies of Industry 4.0, including the IoT, AI, and big data analytics
- Ethical and privacy considerations in the use of Industry 4.0 technologies

II. The Internet of Things in Digital Manufacturing

- Types of connected devices used in digital manufacturing
- Protocols and standards used to connect these devices

- Best practices for designing and deploying connected devices in digital manufacturing

III. Artificial Intelligence in Digital Manufacturing
- Types of AI algorithms used in digital manufacturing
- Applications of AI in digital manufacturing, including predictive maintenance and process optimization
- Challenges and considerations in the use of AI in digital manufacturing

IV. Big Data Analytics in Digital Manufacturing
- Types of data generated by digital manufacturing systems
- Techniques for collecting, storing, and analysing digital manufacturing data
- Applications of big data analytics in digital manufacturing

V. Emerging Technologies in Digital Manufacturing
- Introduction to emerging technologies such as 5G and edge computing
- Potential impact of these technologies on digital manufacturing
- Opportunities and challenges presented by these technologies

VI. Real-World Digital Manufacturing Projects and Case Studies
- Working on real-world digital manufacturing projects and case studies
- Applying the knowledge and skills learned in the module to solve problems and improve systems
- Communicating findings and insights effectively to both technical and non-technical audiences

VII. Guest Lectures and Industry Visits
- Guest lectures from industry experts on the latest trends and challenges in digital manufacturing and Industry 4.0
- Visits to manufacturing sites to see Industry 4.0 technologies in action.

Part 3: Teaching and learning methods

Teaching and learning methods: The Digital Manufacturing and Industry 4.0 module will be taught through a combination of lectures, hands-on exercises, and real-world projects.

Lectures will provide students with a foundation of knowledge on the basics of the Fourth Industrial Revolution and its impact on manufacturing, as well as the key technologies of Industry 4.0, including the IoT, AI, and big data analytics. These lectures will be supplemented with slides, demos, and other multimedia materials to help students better understand the material.

Hands-on exercises will give students the opportunity to apply what they have learned in a practical setting. These exercises may include working with sample data sets, building and testing digital manufacturing systems, and analysing the results.

Real-world projects will allow students to work on digital manufacturing problems and projects that are relevant to the field of Industry 4.0. These projects will provide students with the opportunity to apply their knowledge and skills in a practical setting, and to gain experience working on real-world problems.

In addition to lectures, hands-on exercises, and real-world projects, the module will also include guest lectures from industry experts and visits to manufacturing sites. These activities will provide students with the opportunity to learn from experienced professionals and see Industry 4.0 technologies in action in the real world.

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

MO1 Identify, understand, and critically analyse the basics, components, and technologies of the digital manufacturing and Industry 4.0. [AHEP M3(F), PO1]

MO2 Identify, justify, and apply industry-standard tools, methods, and protocols to real-world projects and case studies related to digital manufacturing and Industry 4.0 [AHEP M6(F), M15(P), M12(F), M13(F); PO2, PO4, PO7]

MO3 Evaluate the ethical and privacy considerations involved in, and the risks associated with digital manufacturing and Industry 4.0. [AHEP M5 (F), M8(F), M9(F), PO7 & PO8]

MO4 Understand and analyse the latest trends and challenges in digital manufacturing and how to address them, and communicate the analysis findings

and insights effectively to both technical and non-technical audiences. [AHEP M2(F), M4(F), M17(F), PO4, PO5 & PO7]

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 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/items/6aec3267-7728-4ae9-a790-a3e6d16510c5.html?lang=en&login=1

Part 4: Assessment

Assessment strategy: Assessment of this module (for both the sit and the resit) consists of the following:
Presentation:

The presentation assessment for the Digital Manufacturing and Industry 4.0 module will involve students giving a presentation on their final project. This presentation will provide students with the opportunity to share their work with the class and to receive feedback from their peers and the instructor.
The presentation should be approximately 20 minutes in length and should cover the project details.

Students will be expected to use visual aids such as slides or demonstrations to aid in their presentation. They should also be prepared to answer questions from the class and the instructor about their work

Written Assignment:

This assessment for the Digital Manufacturing and Industry 4.0 module will involve students submitting a written report on their final project. This report will provide a detailed documentation of the work completed by the students and will serve as a reference for future work in the field.
The report should be approximately 3000 words in length and should include the project details.
The report should be well-written, clearly structured, and properly formatted. It should also include figures, tables, and other visual aids as appropriate to aid in the understanding of the material.

Assessment tasks:

Presentation (First Sit)
Description: Presentation (20 mins)
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO4

Written Assignment (First Sit)
Description: Written Assignment:

This assessment for the Digital Manufacturing and Industry 4.0 module will involve students submitting a written report on their final project. This report will provide a detailed documentation of the work completed by the students and will serve as a reference for future work in the field.
The report should be approximately 3000 words in length and should include the project details.
The report should be well-written, clearly structured, and properly formatted. It should also include figures, tables, and other visual aids as appropriate to aid in the understanding of the material.
Weighting: 75 %
Final assessment: Yes
Group work: Yes

Learning outcomes tested: MO2, MO3, MO4

Presentation (Resit)
Description: Presentation (20 mins)
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO4

Written Assignment (Resit)
Description: Written Assignment:

This assessment for the Digital Manufacturing and Industry 4.0 module will involve students submitting a written report on their final project. This report will provide a detailed documentation of the work completed by the students and will serve as a reference for future work in the field.
The report should be approximately 3000 words in length and should include the project details.
The report should be well-written, clearly structured, and properly formatted. It should also include figures, tables, and other visual aids as appropriate to aid in the understanding of the material.
Weighting: 75 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO2, MO3, MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechatronics Engineering [Frenchay] MEng 2023-24

Mechatronics Engineering [Frenchay] BEng (Hons) 2023-24