



Module Specification

Biomechatronics

Version: 2025-26, v1.0, 15 Jun 2023

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Part 1: Information

Module title: Biomechatronics

Module code: UFMF41-15-3

Level: Level 6

For implementation from: 2025-26

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: Biomechatronics is the application of mechatronic engineering to human biology, and as such it forms an important subset of the overall mechatronic engineering discipline. This module will overview non-conventional mechanical approaches in nature and show how this knowledge can lead to more creativity in mechatronic design and to better (simpler, smaller, more robust) solutions than with conventional engineering technology. Students will use practical laboratory and workshop skills to research, design, and evaluate biomechatronics solutions.

Features: Not applicable

Educational aims: The module will equip the students with the necessary knowledge of bio-inspired mechatronics solutions that are applied to real-life problems. This module also aims to help students develop their competencies in innovative, critical and systems thinking in the area of bio-mechatronics.

Outline syllabus: -Introduction to Bio-Inspired Design

-Principles of Biomechatronics

- oDesign of Interfaces (physiological and mechatronic systems)

- oThe Four Pillars – Manipulation, Locomotion, Sensory Interactions, Processing & Control

-Introduction to Bioconstruction (how are creatures constructed)

- oMechanical stiffness & motion

- oHydrostatic stiffness & motion

- oBioenergy (biological springs)

-Introduction to Biopropulsion (how do creatures move)

- oMacroscale: Walking, Crawling, Swimming & Flying

- oMicroscale: Propulsion of Single-Celled Organisms

-Introduction to Biodevelopment (how do creatures evolve)

- oEvolution & engineering of living systems

Part 3: Teaching and learning methods

Teaching and learning methods: The 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 Bio-Mechatronics systems. 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 (including UWE cutting-edge research outputs in this area), building and testing Bio-Mechatronics systems, and analysing the results.

Real-world projects will allow students to work on mechatronics problems and projects that are relevant to the industry. 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.

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

MO1 Apply appropriate techniques and solutions to design and develop bio-inspired mechatronics systems that meet a combination of societal, user, business and customer needs.

MO2 Evaluate and investigate mechatronics solutions inspired by biological systems in a laboratory and workshop environment.

MO3 Identify, evaluate and mitigate risks associated with mechatronics in rehabilitation systems.

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/1aa0ba42-18f1-4614-af8f-f575092431ef.html?lang=en&login=1>

Part 4: Assessment

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

Written Assignment

This assessment will involve students submitting a written report on their final project. This report will provide 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 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.

Practical Skills Assessment

This Time-Controlled assessment will involve students completing a set of tasks within a fixed time period. This assessment will test students' ability to work efficiently and effectively under time pressure.

The tasks for this assessment will be based on the material covered in the module and may include running simulations and analysing the results. The tasks will be designed to challenge students and require them to apply their knowledge and skills in a practical setting.

Students will be given access to the necessary tools and software to complete the tasks. The time allowed for the assessment will depend on the complexity of the tasks and the learning objectives of the module.

The Time-Controlled assessment will be assessed based on the following criteria:

- Completion of the tasks within the time allowed
- Accuracy and quality of the work completed
- Ability to work efficiently and effectively under time pressure
- Overall performance on the assessment.

Assessment tasks:

Written Assignment (First Sit)

Description: Written report on final project.

Weighting: 60 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO1, MO2, MO3

Practical Skills Assessment (First Sit)

Description: This Time-Controlled assessment.

Weighting: 40 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO2

Written Assignment (Resit)

Description: Written report on final project.

Weighting: 60 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO1, MO2, MO3

Practical Skills Assessment (Resit)

Description: This Time-Controlled assessment

Weighting: 40 %

Final assessment: No

Group work: No

Learning outcomes tested: MO2

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