



Module Specification

Design and Electromechanical Systems

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Part 1: Information

Module title: Design and Electromechanical Systems

Module code: UFMF88-30-2

Level: Level 5

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: Design, Materials and Manufacturing 2023-24

Excluded combinations: Mechatronics 2023-24

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: The primary aim of this module is to enable the student to understand the multi-disciplinary challenges present in engineering designs that include electromechanical systems in designs and to develop an appreciation of 'TOTAL DESIGN' as a design philosophy.

Pre-requisites: students must take one out of UFMF7C-30-1 Design, Materials and

Manufacturing (Work Based Learning) or UFMFN3-30-1 Design, Materials and Manufacturing.

Features: Not applicable

Educational aims: The key outcome will be the understanding of techniques for product realisation that address the optimal integration of Mechanical, Electronic and Software Engineering to produce superior products, processes or systems, with an understanding of materials selection and manufacturing aspects.

Outline syllabus: The following is indicative; the syllabus may include but not be limited to the following:

Design and application of machine elements:

This section is concerned with the design and application of such elements as columns, shafts, bearings, gears, gear boxes, fasteners, springs, brakes, clutches and other elements relevant to the design of an electromechanical system and their functional capabilities and tolerances.

Application of electromechanical elements:

This section is concerned with batteries and other power sources, electric actuators, microcontrollers and their peripherals, basic electrical circuits, sensors and signals, interfacing, transformers and power supplies, basic closed loop control.

Materials of construction:

This section is concerned with material selection for specific applications; it reviews material properties particularly ferrous materials, material treatments, material properties including toughness, ductility, fatigue and aspects of material selection that relate to performance and failure including various types of stress, wear mechanisms and lubrication.

Manufacture of mechanical elements:

Material removal processes, forming processes, surface finishes and coatings, fabrication and welding, design for manufacture, simple cost calculations.

Design and realisation of Electromechanical Systems

This section examines areas related to the Total Design Activity, user requirements, design specification, concept design and selection, design management and product life cycle management, concurrent engineering, design of integrated electromechanical systems and software interfacing, introduction to design optimisation and use of Excel Solver, design failure mode and effect analysis.

Part 3: Teaching and learning methods

Teaching and learning methods: Large group lecture supported by small group tutorial sessions. Study time outside of contact hours will be spent on going through design exercises and example problems.

Laboratory sessions (small groups) will provide experience of empirical methods and will require further non-contact time or assignment preparation.

Scheduled learning includes lectures, tutorials and lab sessions.

Independent learning includes engaging with essential reading, assignment preparation and completion, exam preparation, skill and knowledge development.

Students will be required to complete assignments in own time using CAD facilities provided by University.

Approximate hours:

Contact 72

Assimilation and skill development 78

Exam and Coursework preparation and engagement 150

Total 300

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

MO1 Apply quantitative methods to Electromechanical (Mechatronic) systems and solve Mechatronic system problems

MO2 Identifying and Creating computer aided models for simple mechatronics systems

MO3 Selection of electromechanical components (e.g. sensors, actuators) based on an understanding of their characteristics

MO4 Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety, cost and risk assessment issues.

MO5 Use information from dynamic model to calculate various performance metrics and use these metrics to produce mechanical design for the system

MO6 Perform optimisation studies and provide a comprehensive report of the project detailing the engineering design, control strategy and controller design and equipment for the system

MO7 Show cognitive skills with respect to modelling and simplifying real problems, and applying mathematical methods of analysis, and understanding the capabilities of computer based modelling and design

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

Reading list: The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://uwe.rl.talis.com/modules/ufmf88-30-2.html) via the following link <https://uwe.rl.talis.com/modules/ufmf88-30-2.html>

Part 4: Assessment

Assessment strategy: Assessed via an extended coursework.

The Coursework will consist of lab work, Mechanical Engineering Design,

Electromechanical System (Mechatronics) techniques, Materials Selection, Manufacturing Techniques and the use of CAD to ensure focus is maintained on the practical nature of engineering design and realisation processes. Lab work is essential for gaining a practical understanding of fundamentals and applications of Mechatronic systems and will be assessed via a Lab Report which is part of the Coursework. The Design Report and the Materials/Manufacturing Report will form the rest of the Coursework. A word limit is not applicable for reports on Design assignment. Specific instructions on structure of reports will be offered depending on the assignments.

Assessment tasks:**Report (First Sit)**

Description: Coursework Report

Weighting: 100 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4, MO5, MO6, MO7

Report (Resit)

Description: Coursework report

Weighting: 100 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4, MO5, MO6, MO7

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechanical Engineering (Mechatronics) [AustonSingapore] BEng (Hons) 2023-24

Mechanical Engineering [UCS] FdSc 2022-23

Mechanical Engineering [Gloscoll] FdSc 2022-23

Mechanical Engineering and Technology {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechanical Engineering and Technology (Manufacturing) {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechanical Engineering and Technology (Vehicle Technology) {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechanical Engineering and Technology (Mechatronics) {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechanical Engineering and Technology (Manufacturing) {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechanical Engineering and Technology {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechanical Engineering and Technology (Mechatronics) {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechanical Engineering and Technology (Vehicle Technology) {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Mechanical Engineering and Vehicle Technology {Foundation} [Feb][FT][GCET][4yrs] - Withdrawn BEng (Hons) 2021-22

Mechanical Engineering and Vehicle Technology {Foundation} [Oct][FT][GCET][4yrs] - Withdrawn BEng (Hons) 2021-22

Mechatronics [Sep][PT][UCS][3yrs] FdSc 2021-22

Mechatronics [Sep][PT][GlosColl][3yrs] FdSc 2021-22