## Unit 6: Mechatronics

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<tr>
<th>Unit code</th>
<th>T/615/1480</th>
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<tr>
<td>Unit level</td>
<td>4</td>
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<td>Credit value</td>
<td>15</td>
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### Introduction

Auto-focus cameras, car cruise control and automated airport baggage handling systems are examples of mechatronic systems. Mechatronics is the combination of mechanical, electrical and computer/controlled engineering working together in automated systems and ‘smart’ product design.

Among the topics included in this unit are: consideration of component compatibility, constraints on size and cost, control devices used, British and/or European standards relevant to application, sensor types and interfacing, simulation and modelling software functions, system function and operation, advantages and disadvantages of software simulation, component data sheets, systems drawings, flowcharts, wiring and schematic diagrams.

On successful completion of this unit students will be able to explain the basic mechatronic system components and functions, design a simple mechatronic system specification for a given application, use appropriate simulation and modelling software to examine its operation and function, and solve faults on mechatronic systems using a range of techniques and methods.

### Learning Outcomes

By the end of this unit students will be able to:

1. Explain the design and operational characteristics of a mechatronic system.
2. Design a mechatronic system specification for a given application.
3. Examine the operation and function of a mechatronics system using simulation and modelling software.
4. Identify and correct faults in a mechatronic system.
Essential Content

LO1 Examine the design and operational characteristics of a mechatronic system

Origins and evolution:
History and early development, evolution
Practical examples and extent of use
Current operational abilities and anticipated improvements

Systems characteristics:
Design of systems in an integrated way
Sensor and transducer types used
Consideration of component compatibility
Constraints on size and cost
Control device requirements and examples of applications

LO2 Design a mechatronic system specification for a given application

Systems specifications:
British and/or European standards relevant to application
Sensor types and interfacing
Actuator technology availability and selection
Selection and use of appropriate control software/devices.
Consideration of the interaction of system variables
System commissioning parameters

LO3 Examine the operation and function of a mechatronics system using simulation and modelling software

Operation and functions:
Simulation and modelling software functions
System function and operation
Modes of operation simulation, loading and surges
Advantages and disadvantage of software simulation
LO4 **Identify and correct faults in a mechatronic system**

*Locating and correcting system faults:*

- Component data sheets, systems drawings, flowcharts, wiring and schematic diagrams
- Original system correct function and operation
- Inspection and testing using methodical fault location techniques and methods, use of control software to aid fault location
- Identification, evaluation and verification of faults and their causes, rectification, final system testing and return to service
<table>
<thead>
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<th>Learning Outcomes and Assessment Criteria</th>
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<tr>
<td><strong>Pass</strong></td>
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<tr>
<td><strong>LO1</strong> Examine the design and operational characteristics of a mechatronic system</td>
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<tr>
<td><strong>P1</strong> Describe the key components of a given mechatronics system</td>
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<tr>
<td><strong>P2</strong> Identify the types of actuators, sensors and transducers used in the mechatronics system</td>
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<td><strong>D2</strong> Investigate the operational capabilities and limitations of the mechatronics system design specification produced</td>
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<tr>
<td><strong>LO2</strong> Design a mechatronic system specification for a given application</td>
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<tr>
<td><strong>P3</strong> Select the relevant sensor and the appropriate actuator technologies and produce a design specification suitable for these selections</td>
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<tr>
<td><strong>D2</strong> Evaluate the operational capabilities and limitations of the mechatronics system design specification produced</td>
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<td><strong>LO3</strong> Examine the operation and function of a mechatronics system using simulation and modelling software</td>
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<td><strong>P4</strong> Demonstrate industry standard mechatronics simulation/modelling software</td>
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<td><strong>D4</strong> Investigate the causes of faults on a mechatronics system and suggest alternatives to the design specification to improve reliability</td>
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<tr>
<td><strong>LO4</strong> Identify and correct faults in a mechatronic system</td>
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<tr>
<td><strong>P5</strong> Explain the safe use of fault finding test equipment</td>
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<td><strong>P6</strong> Locate and rectify faults on a mechatronic system</td>
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Recommended Resources

Textbooks


Journals

Links
This unit links to the following related units:

*Unit 15: Automation, Robotics and Programmable Logic Controllers (PLCs)*

*Unit 54: Further Control Systems Engineering*