

Module code: MOD009175	Version: 1 Date Amended: 07/Feb/2023
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1. Module Title
Robotics Design and Manufacturing

2a. Module Leader
Shabnam Sadeghi Esfahlani

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
7

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions			
Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:			

6a. Module Description

Supervisory control and data acquisition (SCADA) is a technique of software and hardware components that permits industrial organizations to:

- Manage industrial processes locally or remotely.
- Monitor, gather data and process it in real-time.
- Interact with devices directly including sensors, valves, pumps, motors, etc via human-machine interface (HMI) software.
- Log events into a log file.

SCADA systems are essential for industrial institutions as they help to retain efficiency, process data for more intelligent decisions, and communicate system concerns.

The primary SCADA architecture starts with programmable logic controllers (PLCs) or remote terminal units (RTUs).

PLCs and RTUs are microcomputers that communicate with an array of entities, (factory machines, HMI, sensors, and end devices), and then route the information from those objects to computers with SCADA software.

The SCADA software processes, distribute, and displays the data, allowing operators and other employees to analyse the data and make crucial decisions.

The module enables students to design a SCADA robot's mechanical and control system considering potential real-world applications, i.e., Smart City, Smart Manufacturing, etc. They use a combination of hardware and software to automate industrial processes while capturing Operational Technology (OT) using real-time data.

Connect the sensors that monitor equipment to an onsite or remote server for example

- Control processes locally or at remote locations,
- Acquiring, analysing, and displaying real-time data,
- Directly interacting with industrial equipment,
- Record and archive events for future reference or report creation.

A particular focus will be on Industry 4.0 technologies and their importance in operating modern manufacturing environments. You will work as team members to design and analyse a SCADA robot's physical model focusing on the business or customers' needs.

6b. Outline Content

Using RTUs and PLCs as local collection points for acquiring sensor information to enable the connected piece of equipment via programmed logic. Gather the collected data from the sensors by a computer or gateway. Monitor and control processes via SCADA systems in which actions are performed.

Students are required to:

- Clearly define and understand what needs to be monitored
- Determine what data they need to collect and how
- Do a proof of concept (POC) by choosing a set of data and a location
- Identify the architecture to scale the needs
- Add gateways to link existing data collection matters
- Create new data pool points as required
- Centralize the data to the intended monitoring location
- Map data in the SCADA software of preference
- Add visualizations of data and controls
- Define automation and controls

6c. Key Texts/Literature

The reading list to support this module is available at: <https://readinglists.aru.ac.uk/>

6d. Specialist Learning Resources

Microcontrollers, embedded systems

7. Learning Outcomes (threshold standards)

No.	Type	On successful completion of this module the student will be expected to be able to:
1	Knowledge and Understanding	Classify and apply appropriate hardware and software to automate industrial processes by capturing Operational Technology; recognise the scope and the limitations.
2	Intellectual, practical, affective and transferrable skills	Determine and implement modern industrial automation via SCADA solutions that evidence originality and meet a combination of business and customer need as appropriate.
3	Intellectual, practical, affective and transferrable skills	Evaluate the environmental and societal impact of the proposed solutions and reduce the adverse impacts.
4	Intellectual, practical, affective and transferrable skills	Function effectively as a team member or leader; evaluate the effectiveness of own and team performance.

8a. Module Occurrence to which this MDF Refers				
Year	Occurrence	Period	Location	Mode of Delivery
2026/7	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	Hours	Learning Outcomes	Details of Duration, frequency and other comments
Lectures	18	1,3	Three hours per week for 6 weeks
Other teacher managed learning	18	2,4	Three hours per week for 6 weeks
Student managed learning	114	1-4	Student-managed study, engage with team members and work towards the assessment elements
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
010	Coursework	1-2	60 (%)	Fine Grade	40 (%)
Maximum 2000 words report, Teamwork with the physical model of the SCADA platform; maps to Engineering Council Learning Outcomes M3, M5					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
011	Practical	3-4	40 (%)	Fine Grade	40 (%)
Team presentation (the equivalent of 1000 words report) maps to Engineering Council Learning Outcomes M7, M16					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:

(a) achieve the qualifying mark for each element of fine graded assessment as specified above

(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]