

<b>Module code:</b> MOD009177	<b>Version:</b> 1 <b>Date Amended:</b> 07/Feb/2023
-------------------------------	--

<b>1. Module Title</b>
Sensing and Sensors Fusion

<b>2a. Module Leader</b>
Shabnam Sadeghi Esfahlani

<b>2b. School</b>
School of Engineering and the Built Environment

<b>2c. Faculty</b>
Faculty of Science and Engineering

<b>3a. Level</b>
7

<b>3b. Module Type</b>
Standard (fine graded)

<b>4a. Credits</b>
15

<b>4b. Study Hours</b>
150

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

## LEARNING, TEACHING AND ASSESSMENT INFORMATION

### 6a. Module Description

The module aims to provide the you with a comprehensive knowledge of different types of sensors and their relevance for the control systems and the architectures for the fusion of information coming from the plethora of sensors available. The module aims to systematically analyse industry motivations, legislations, roadmaps and customer requirements. Key parameters to critically compare different sensors are discussed, and issues related to sensor limitations and different performances are evaluated with an emphasis on system architecture and control. Topics are introduced from a practical viewpoint thus allowing you, as a student undertaking this module, to be able to critically evaluate key design parameters and independently apply the learning to a wide range of practical electronic sensors and systems deployed to achieve smartly connected and autonomous systems.

### 6b. Outline Content

Introduction to sensors, their function, properties and classifications;

Sensors: working principles and interaction with the environment;

Use of control theory in automotive electronics systems with sensors and actuators;

Introduction to sensors fusion;

Levels of sensor fusion

Sensor fusion and its relationship with electronic system architecture and different strategies for sensor fusion;

Challenges related to sensor fusion and connected systems;

Latest trends in research on sensors and sensor fusion for autonomous systems.

### 6c. Key Texts/Literature

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

### 6d. Specialist Learning Resources

Specialist laboratory equipment MATLAB/SIMULINK

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	Select and critically evaluate technical literature and other sources of information relevant to sensor fusion problems.
2	Intellectual, practical, affective and transferrable skills	Apply knowledge of the theory and implementation of sensors to the solution of complex engineering issues.
3	Intellectual, practical, affective and transferrable skills	Select and apply appropriate computational and analytical techniques to model complex sensor systems, discussing the scope and limitations of the techniques employed.
4	Intellectual, practical, affective and transferrable skills	Function effectively as an individual or within the team, as a member or a leader, and evaluate the effectiveness of the team's performance.

8a. Module Occurrence to which this MDF Refers				
Year	Occurrence	Period	Location	Mode of Delivery
2024/5	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	24	1-4	Lecture 3 hrs for 8 weeks
Other teacher managed learning	12	3-4	Lab 3 hrs for 4 weeks
Student managed learning	114	1-4	Self-study
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	1-3	60 (%)	Fine Grade	40 (%)
Report (2000 words), maps to Engineering Council Learning Outcomes M3, M4					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
011	Practical	1 3 4	40 (%)	Fine Grade	40 (%)
Group presentation, 15 minutes and Q&A (equivalent to 1000 words), maps to Engineering Council Learning Outcomes M3, M7					

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]