Module Specification

Assistive Robotics

Version: 2025-26, v2.0, Approved

Contents

Part 1: Information

Module title: Assistive Robotics

Module code: UFMFSR-15-M

Level: Level 7

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: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Between 2000 and 2040, the proportion of the world's population of those over 60 years old is expected to double from about 11% to 22%. Ageing, particularly due to sedentary lifestyles and long-term illness, results in increased frailty and prevalence of chronic diseases, resulting in difficulties in performing activities of daily living activities. Providing cost-effective and high quality support for an aging population, who have to cope with a range of disabling conditions, is a high priority issue for all governments. Assistive robotics is increasingly becoming recognised as

a potential enabler in helping people improve their quality of life and live independently, particularly in later life. As a result, Assistive robotics, which include systems for use in domestic, social care housing, and healthcare settings, is one of the fastest growing sectors in robotics. According to a recent business report, the assistive robotics market is expected to register a compound annual growth rate of 21% over the forecast period of 2019-2024.

This module will introduce you to the fundamentals of assistive robotics. Starting with understanding a range of typical assistive scenarios and robots, together with the associated human physical, sensory and cognitive conditions and disabilities that need to be considered when designing and deploying such systems, you will also gain knowledge of key areas within robotics that are core to realising assistive robotic solutions.
In order for assistive robots to be successfully deployed, their operational safety is required at multiple levels - from safe navigation to safe cognitive and physical human-robot interaction and collaboration. This requires developing contextual and social intelligence for robots so that they are able to interact appropriately and reliably in real-time. In this module, you will learn about the state-of-the-art research in recognising and integrating both environmental contexts and human user behaviour and health status through heterogeneous sensor data fusion and adaptive machine learning. To prove that an assistive robot is dependable in a highly dynamic environment, a series of tests and analysis with end-users must be carried out. As such, you will be introduced to current techniques for validation and verification in different scenarios, specifically considering operation in unstructured environments where the end-users interacting with these are likely to have a range of sensory, cognitive and mobility impairments.

Features: Not applicable

Educational aims: The key aim of this module is to enable students to gain knowledge and experience of a key application area - assistive robotics.
Learning about assistive robotics can only be accomplished in conjunction with a clear and critical understanding of the contexts in which these technologies are needed. This will therefore include learning about a range of disabilities and user needs, and being able to use this knowledge to evaluate the appropriateness of

different assistive robotic solutions in relation to multi-dimensional criteria.
By the end of this module students will therefore have the skills to identify functional and non-functional requirements for assistive robots by considering specific user accessibility needs and disabilities, for use in a given context.
Another education aim is to give them the skills to be able to critically review the challenges and limitations of providing assistance through the use of an assistive robot in a specific real-world context from the perspectives of different stakeholders.
In working on a group project and producing their individual report they will review the state-of-the-art research literature so that they have the skills to consider, select and implement approaches to solve a particular fundamental challenges as part of an assistive robotic task.
Another educational aim is to ensure that students can define an appropriate set of evaluation criteria and critically appraise the functional and non-functional performance of assistive robots. This will be reinforced through the practical work.

Outline syllabus: Syllabus Outline:

Introduction to Assistive Robotics.

Understanding Physical, Sensory and Cognitive Disabilities and Long-term conditions:
International Classification of Disability and Clinical Frailty Index.
Assistive Technology Assessment Process Model and Basic Definitions.
Human Factors and Ergonomics.

Accessible Human-Robot Interaction Design and Evaluation:
Universal Design Principles and Accessible Interaction Devices and Methods.
Participatory Design Methodology and challenges.
Inclusive evaluation approaches.

Socially and Physically Assistive Robots:
Review of State-of-the-art.
Critical evaluation of scope, function and fundamental challenges.

Rehabilitation Robotics, Prosthetics and Exoskeletons:
Review of the State-of-the-art.
Materials and Adaptable form factors (including soft robotics and wearables).

Interdisciplinary Aspects of Assistive Robot Design, Development and Deployment:
Health and social care professionals – roles and responsibilities.
Current care provision and contexts.
Role of product design and aesthetics – user acceptance models.

Intelligent Sensing and Instrumentation in a Health Context:
Invasive and non-invasive sensing.
Biometric, physiological and environmental sensing.
Approaches for temporal data analysis and learning.

Part 3: Teaching and learning methods

Teaching and learning methods: The practical sessions for this module, which will contribute to the coursework assignment and run in parallel to the lecture sessions, will involve working in teams on a robotic platform to achieve an assistive task. Each sub-group within a team will focus on a specific functionality to achieve the task, such as human-robot interaction, scene analysis, person recognition, navigation, object recognition, grasping and manipulation, culminating in integrating the different functions to realise the overall task. This will give you the opportunity of developing and applying in-depth knowledge and skills in a specific area of interest as related to assistive robotics, but also understanding the scope of the different fundamental areas and the pragmatic challenges of working on a real-world assistive task.

Scheduled Learning includes lectures and practical laboratory sessions

Independent Learning includes time spent on essential and further reading, coding and testing in the practical sessions, completion of the coursework assignment and exam preparation.

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

MO1 Identify functional and non-functional requirements for assistive robots by considering specific user needs in each context, the existing assistive robotic solutions, different disability models and frameworks and propose a solution following the requirements.

MO2 Define a set of evaluation criteria to critically appraise the performance of an assistive robot to perform a series of functions in a specific assistive context.

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ufmfsr-15-m.html

Part 4: Assessment

Assessment strategy: Assessment: Report (six pages)
A written report, limited to six pages (including figures, tables, and references). Students will follow a provided template and summarize the practical work conducted as part of the group project. Students will select a specific assistive robotics need from a provided list and conduct a literature and commercial review of existing solutions. Based on this analysis, the report will outline the functional and non-functional requirements for an assistive robot tailored to the chosen context.
This exercise allows students to delve into the challenges of a particular subfield within assistive robotics while refining their scientific writing and critical thinking skills. The report will also detail two solutions designed during the practical sessions, utilizing available assistive robot platforms and simulation environments. These solutions will be demonstrated in a group presentation during the final practical

session.
Lastly, the report will propose an assessment framework for evaluating the performance of the robotic solutions. It will specify the evaluation criteria used and describe the methods employed to assess the performance of individual functions and the overall task execution.
Students will be supported to successfully complete their assessment through interaction with course tutors during the timetabled practical sessions and ad hoc drop-in tutorials throughout the teaching block.

The resit assessment strategy is the same as the first sit assessment presenting the proposed solutions as a system architecture and using the simulation environments

Assessment tasks:

Report (First Sit)
Description: Individual written report summarizing practical group work (6-page max)
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2

Report (Resit)
Description: Individual written report summarizing practical group work (6-page max)
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Health Technology [Frenchay] MSc 2024-25

Health Technology [Frenchay] MSc 2025-26

Robotics {Joint Award}[Frenchay] MSc 2025-26

Robotics and Autonomous Systems {Joint Award}[Frenchay] PhD 2025-26

Robotics and Autonomous Systems {Joint Award}[Frenchay] PhD 2025-26

Health Technology [Frenchay] MSc 2025-26