UNIVERSITY OF MALTA

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Department of Artificial Intelligence

Study-Unit: ARI3215 Robotics 2

Assessment: 100% Project

Submission Deadline: 4th January 2026

Demo & Presentation: 5th January 2026 08:00-10:00

The Thinking Robot Project

Your task is to design, implement, and demonstrate an autonomous robotic system that exhibits intelligent behaviour. The goal is to build a robot or simulation that can sense, reason, and act autonomously, demonstrating key aspects of embodied artificial intelligence.

You may choose either a hardware implementation using the Elegoo Smart Robot Car V4 or a software simulation using ROS 2 Jazzy Jalisco in Gazebo or Webots. Each team will work collaboratively to design the robot's architecture, integrate at least two sensors or input sources, and develop an autonomous behaviour driven by sensor data and intelligent decision-making.

Projects should highlight creativity, technical implementation, and a clear link to artificial intelligence principles of perception, reasoning, and action. Teams are encouraged to explain briefly how their system demonstrates AI in action, and reflect on its ethical and societal implications in the final report.

Example Application Themes

A. Adaptive Navigation

Design a robot that navigates dynamically through an environment, adapting to changing obstacles or paths.

B. Human-Aware Robotics

Develop a robot that perceives and interprets human behaviour to adapt its actions intelligently, e.g., maintaining safe distance, responding to gestures with context, or collaborating on simple tasks.

C. Multi-Agent Intelligence

Coordinate two or more robots or simulated agents to achieve a shared goal, e.g., leader-follower or chase-and-evade behaviour.

Project Requirements

- Integrate at least two sensors or input sources.
- Exhibit autonomous behaviour (no manual control).
- Include a simulation or visualisation component to demonstrate how your robot perceives, reasons, or acts. Teams working primarily in software may use ROS 2 Gazebo or Webots simulation. Teams focusing on physical robots may instead provide a visualisation (e.g. plots, dashboards, or RViz displays) that clearly illustrates system behaviour.
- Demonstrate measurable performance (e.g., accuracy, efficiency, stability).
- Show a clear link to AI concepts such as perception, reasoning, or adaptation.

Your robot should not only act… it should think. 

Demonstration Day

Each team will:

- Present a short overview (3-4 minutes) of their system architecture, objectives, and results.

- Perform a live demonstration of the robot or simulation.
- Answer questions about design choices, implementation, and evaluation.

All demonstrations will take place in the ICT Informatics Lab -1, B, 2.

Proposal Submission (Weeks 5 - 7 – Ungraded Checkpoint)

Each team must submit a ½–1-page proposal outlining:

- Project title & short description
- Track (Hardware / Simulation)
- Main objective
- Sensors or inputs used
- Expected outputs / behaviours
- Team members & roles

The proposal is compulsory but ungraded. Feedback will be provided before full development begins.

Submission Requirements

- Final Report: 5 pages (maximum) submitted via VLE Turnitin by 4th January 2026.
- All project code should be hosted on a GitHub repository.

Teamwork and Integrity: Collaboration and equal contribution are essential. All members must participate in the design, implementation, and demonstration. Any plagiarism or reuse of code without citation will be penalised according to University policy.

Assessment Rubric (100 marks)

Criterion	Excellent (85–100%)	Good (65–84%)	Satisfactory (50–64%)	Weak / Incomplete (<50%)	Marks
System Design & Planning	Clear, innovative concept demonstrating strong understanding of autonomy, sensing, and control. Architecture is well structured, roles clearly defined, and justified design choices evident.	Sound design addressing autonomy and control. Architecture mostly clear, though some elements may lack depth or full justification.	Basic concept with limited integration of autonomy or sensing. Design shows partial understanding; unclear division of tasks.	Minimal or incoherent design. No clear plan or understanding of autonomy, sensing, or control.	15
Implementation & Technical Work	Functional and well-engineered robot/simulation demonstrating intelligent autonomous behaviour with ≥2 sensors or inputs. Implementation is efficient, robust, and original.	Robot/simulation functions reliably with multiple sensors. Some intelligent behaviours demonstrated, though minor issues or limitations exist.	Robot/simulation achieves limited functionality; autonomy is basic or partially implemented.	Implementation incomplete or non-functional. No evidence of autonomous behaviour.	35
Testing & Evaluation	Comprehensive testing with quantitative and qualitative results. Clear analysis of performance and reasoning about limitations.	Adequate testing with some analysis of results. Partial discussion of performance or improvements.	Minimal testing; results presented with little analysis.	No testing or evidence of validation.	20
Documentation & Reflection	Report is professional, well-structured, and insightful. Explains design, code, AI principles (perception,	Clear documentation of design and results. Some reference to AI concepts and ethics but lacks depth.	Basic report covering design and implementation only; limited discussion of AI	Incomplete or poorly written documentation. No reflection on AI or	20

Criterion	Excellent (85–100%)	Good (65–84%)	Satisfactory (50–64%)	Weak / Incomplete (<50%)	Marks
	reasoning, decision-making), and ethical implications clearly.		or ethics.	ethics.	
Presentation & Professionalism	Engaging, clear, and well-timed presentation. All members contribute; strong grasp of project details and critical discussion.	Clear presentation; good teamwork and understanding. Minor timing or content issues.	Presentation understandable but unbalanced; some lack of depth or contribution.	Unclear or unprepared presentation; poor teamwork or missing members.	10