UOW MALAYSIA KDU PENANG UNIVERSITY COLLEGE

PART OF THE UNIVERSITY OF WOLLONGONG AUSTRALIA GLOBAL NETWORK

ASSIGNMENT COVER PAGE

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Programme	**Course Code and Title**
Bachelor of Computer Science (Hons)	CAI3034N Autonomous Mobile Robotics
Student's name / student's id	**Lecturer's name**
	Dr. Ooi Woi Seng

Date issued	**Submission Deadline**	**Indicative Weighting**
Week 5 (3/3/2025)	Week 9 (7/4/2025)	30%
Assignment 2 title	Metal-Detecting Robot with Obstacle Avoidance and Feedback	

This assessment assesses the following course learning outcomes

# as in Course Guide	**UOWM KDU Penang University College Learning Outcome**
CLO2	Critically evaluate the range of possible applications for mobile robotic systems including requirements for industrial, service and social robotics, human-robot interaction, robot vision and sensing, and ethical and economics analysis of robot. (C5, PLO7)
# as in Course Guide	**University of Lincoln Learning Outcome**
CLO2	Critically evaluate the range of possible applications for mobile robotic systems including requirements for industrial, service and social robotics, human-robot interaction, robot vision and sensing, and ethical and economics analysis of robot. (C5, PLO7)

Student's declaration

I certify that the work submitted for this assignment is my own and research sources are fully acknowledged.

Student's signature: Submission Date:

Dates and Mechanisms for Assessment Submission and Feedback

Mechanism for handout to students	CAMU LMS/ Microsoft Teams
Mechanism for submission of work by student	*Soft copy online submission via CAMU/* Microsoft *Teams*
Date by which work, feedback and marks will be returned to students	Week 11 (21/4/25 - 25/4/25)
Mechanism for return of assignment work, feedback and marks to students	Feedback will be provided by a marking template. This will be available to students via CAMU/ Microsoft Teams. The discussions at the walkthroughs will also provide informal feedback

COURSEWORK SUBMISSION GENERAL INFORMATION

Academic Integrity Statement

You must adhere to the university college regulations on academic conduct. Formal inquiry proceedings will be instigated if there is any suspicion of plagiarism or any other form of misconduct in your work. Students must **NOT** collude with other groups of students or plagiarise their work.

We practice zero tolerance towards plagiarism, and we use Turnitin to evaluate the similarity index. Your similarity index score must not exceed 20%.

Your tasks must be your own work. Unless the use of Artificial Intelligence (AI) is permitted in your assessment task, using AI to complete your assignment is a form of plagiarism.

Nature of the submission required

A soft copy of your assignment saved in **PDF version** should be submitted to lecturer, no later than the date and time stipulated on the cover sheet. In addition, an electronic copy of your work must be submitted to Turnitin. The first page of your report, immediately after the cover page, must be a page from Turnitin clearly showing your name and your Originality Score (Please refer to submission arrangement).

Diagrams may be used where they are helpful to support your arguments or description. If they are not your own work, the source must be referenced. Please help us to handle and mark your work efficiently.

Please take note for group submission, only **one submission per group**. This will contain both the group and individual elements. The individual element must be clearly labelled to indicate which group member completed the task.

Documentation guidelines

Student is required to submit a **soft copy** of the report and ensure that it uses the following formatted styles: 1) Font type: **Arial**, 2) Font size: **11 points**, 3) Line spacing: **Single spacing** and 4) Page layouts: **Justify**. Please make sure you have proper format alignment for all paragraphs, following standard writing style and use **Harvard citation style** for citation. Please include a **header** with the following information: **Student ID, Student name, Course code, and Assignment type**. Please also include a proper cover page for your submission which contains information about the students, assignment, course, and department with UOWM KDU Penang University College and University of Lincoln (UoL) logos on top (Please remove the UoL logo from the UCSWW programme). Also include page number at the footer page and a list of references, which is shown on the last page.

Penalties for Late Submission

For late submission of this Assignment, a penalty of a reduction by 10% of the maximum mark may be applicable for each Calendar Day or part thereof that the submission is late. An Assignment submitted more than **TEN** Calendar Days after the deadline will have a mark of zero recorded for this Assignment.

Submission arrangement

1. Cover page
2. Turnitin similarity report
3. Table of content
4. Main report
5. Reference list or bibliography list (whichever applicable)
6. Marking rubric (in landscape orientation)

File naming convention

Please make sure you save your filename with the following format:

- <Student Name>_coursecode_A2_Feb25.pdf

Assignment instructions/Background

Description

This assignment is an **individual assignment.** Each student must write and submit an individual report. The report should contain the full development steps of your algorithms, the problems that you overcame (or not) while conducting the experiments, and a copy of your source code for verification purposes.

Task: Metal-Detecting Robot with Obstacle Avoidance and Feedback (30%)

Metal detection is important in many industries and fields. From detecting weapons in public spaces to locating buried pipes or valuable artifacts, metal detection systems have become essential tools in ensuring safety, supporting construction projects, and assisting in archaeological research. As technology advances, metal detectors are becoming more accurate and efficient, making them even more important in day-to-day applications.

In this assignment, you are equired to design and build a robot capable of detecting and responding to metal presence beneath it. Your robot will navigate its environment using obstacle-avoidance capabilities and simulate metal detection beneath its chassis. Your designed robot should be able to provide visual and auditory feedback, such as activating an LED or buzzer, when metal is detected. This assignment will deepen your understanding of sensor-based robotics and the practical applications of such system.

Task Requirements

Hardware Setup:
Assemble the Cyberbot with necessary components, including:
- Infrared sensors for obstacle avoidance.
- A phototransistor or metal detector for metal detection.
- A buzzer and LED for detection alerts.

Programming:
Write a program to:
- Control the movement of the robot and obstacle avoidance using infrared sensors.
- Detect metal presence beneath the robot using the chosen sensor.
- Activate the buzzer and LED when metal is detected.
- Ensure efficient and reliable sensor data processing.

Simulation Environment:
Create a testing environment with:
- Obstacles to navigate.
- Metal objects for testing detection capabilities.

Submission guidelines:
- Prepare a comprehensive report documenting the entire process, from hardware configuration to algorithm development.
- Include a clear diagram or schematic of the hardware setup.
- Include any code snippets used in the analysis.
- Showcase the results demonstrating the robot can function autonomously in a simulated environment.

Deadline

The deadline for report submission of this assignment is on 7/4/2025 **(Week 9)**

REPORT COMPONENT (100%)

CAI3034N Autonomous Mobile Robotics
MARKING RUBRIC
ASSIGNMENT 2
Assignment Weighting (30%)

LEARNING OUTCOME	MARKING CRITERIA	SCALE					
		Fail (0-49)	**3rd Class (50-59)**	**2nd Lower Class (60-69)**	**2nd Upper Class (70-79)**	**1st Class (80-100)**	**YOUR MARKS/COMMENTS**
CO2: Critically evaluate the range of possible applications for mobile robotic systems including requirements for industrial, service and social robotics, human-robot interaction, robot vision and sensing, and ethical and economics analysis of robot. (C5, PLO7)	Hardware and algorithm development (40%)	• Improper hardware configuration and algorithm development. • No functional obstacle avoidance. • Fail to detect metal and provide both visual and auditory feedback.	• Basic hardware configuration and algorithm development. • Limited obstacle avoidance; frequent collisions. • Rarely detects metal or fails to provide meaningful visual or auditory feedback.	• Adequate hardware configuration and algorithm development. • Basic obstacle avoidance achieved; occasional errors • Detects metal inconsistently or provides only one type of feedback (visual or auditory).	• Good hardware configuration and algorithm development • Successfully avoids most obstacles; minor errors in complex scenarios. • Detects metal accurately in most cases and provides both visual and auditory feedback, with only minor issues.	• Excellent hardware configuration and algorithm development. • Successfully navigates complex courses with zero collisions. • Successfully detects metal with consistent accuracy and provides both visual and auditory feedback without errors.	
	Documentation (50%)	• Content is inaccurate. Information is incomplete, inaccurate, or not presented in a logical order, making it difficult to follow. • Do not provide details about sensors, technique used in navigation, obstacle avoidance, and metal detection. • No results and discussion.	• Content is either questionable or incomplete. Information is not presented in a logical order, making it difficult to follow. • Little explanation on sensors, technique used in navigation, obstacle avoidance, and metal detection. • Results are presented but poorly discussed.	• Content is accurate but some required information is missing and/or not presented in a logical order, making it difficult to follow. • Reasonable explanation on sensors, technique used in navigation, obstacle avoidance, and metal detection. • Results are presented with reasonable discussion.	• Content is accurate but some required information is missing and/or not presented in a logical order, but is still generally easy to follow. • Good explanation on sensors, technique used in navigation obstacle avoidance, and metal detection. • Results are presented with good discussion.	• Content is accurate and all required information is presented in a logical order. • Excellence explanation on sensors, technique used in navigation, obstacle avoidance, and metal detection. • Results and discussion are very well presented which give the reader important information that goes beyond the obvious or predictable.	
	Code quality (10%)	• Very poor program structure and without code comments.	• Poor program structure but with some code comments.	• Clear program structure and appropriate comments.	• The program code is well structured and commented.	• The program code is efficient, well structured, and commented.	
						Overall score (100%)	