



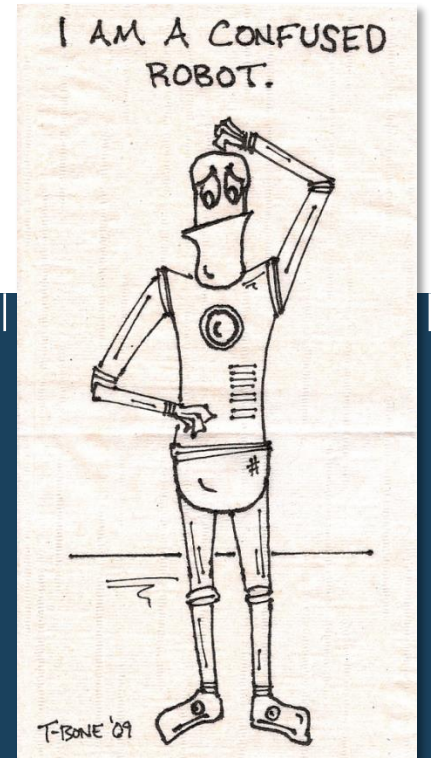
**POLITECNICO**  
MILANO 1863

# Robotics

*Course Introduction*

Matteo Matteucci  
*matteo.matteucci@polimi.it*

*Artificial Intelligence and Robotics Lab - Politecnico di Milano*



# About me and my lectures ...

Lectures given by Matteo Matteucci

- +39 02 2399 3470
- [matteo.matteucci@polimi.it](mailto:matteo.matteucci@polimi.it)

## Research Topics

- Robotics and Autonomous Systems
- Computer Vision and Perception
- Pattern Recognition & Machine Learning
- Benchmarking in Robotics



*Aims of these lectures: learning how to design and implement the software which makes autonomous an autonomous mobile robot (e.g., symbolic planning, trajectory planning, localization, perception, mapping, etc.)*

## ... what about the course?

All the infos on the course website

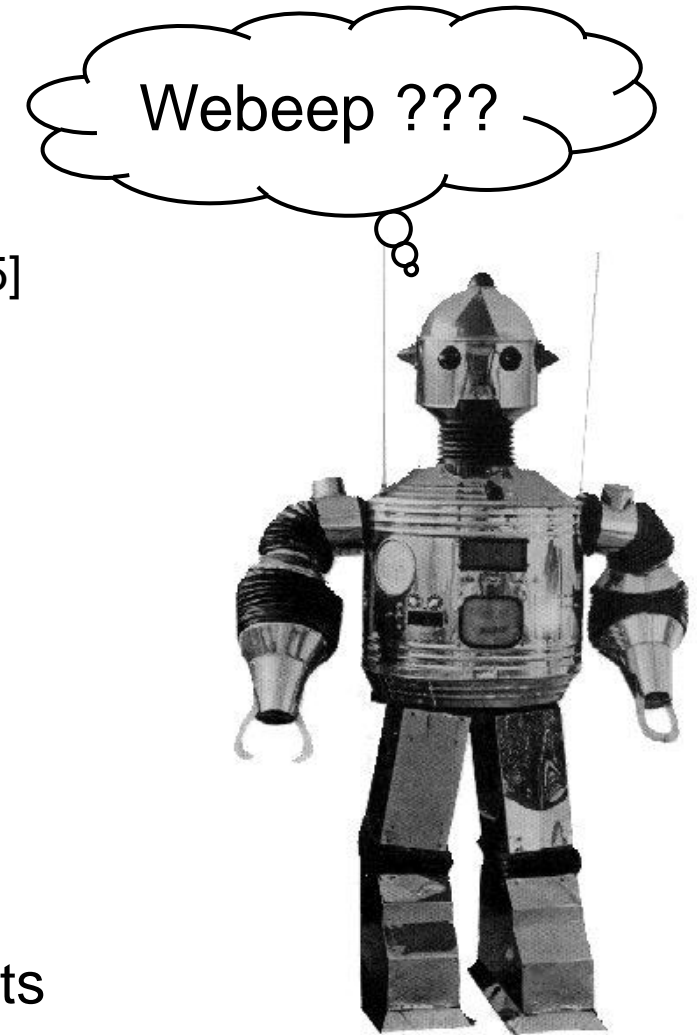
- <https://chrome.deib.polimi.it/index.php?title=Robotics>
- Webeep: 089013 - ROBOTICS (MATTEUCCI MATTEO) [2024-25]

Lectures given by:

- Matteo Matteucci (Lecturer ~30h)  
matteo.matteucci@polimi.it
- Simone Mentasti (Teaching Assistant ~20h)  
simone.mentasti@polimi.it

Course in code sharing!!

- Robotics
- Perception, localization, and mapping for mobile robots



# Lectures outline / approach

## Introduction to (mobile) robotics

*The mind of a mobile robot*

## Anatomy of a mobile robot

- Sensors and actuators
- Common Kinematics

## Localization and Mapping

- Localization vs Mapping
- Simultaneous Localization & Mapping

## Robot autonomous navigation

- Motion control and obstacle avoidance
- Trajectory following
- Trajectory planning  
(graph and sample based)

«Theory»

## Middleware in robotics

- Motivations and state of the art
- ROS Installation party

## ROS Basics

- Publisher/subscriber
- Messages, services, parameters
- Bags, tb, actionlib, rqt\_tools
- Message filters, rospy

## ROS Advanced

- ROS on multiple machines
- Time synchronization
- Stage

## Navigation in ROS

## ROS2 & ...

Linux Ubuntu + ROS 1.0

«Practice»



# Course organization / rules

Classes (no distinction between lecture and exercise day):

- Wednesday, 12:15 – 14:15, in 26.11
- Thursday, 14:15 – 16:15, in 26.11

Cum tempore!

May change ...

Detailed calendar online (updated weekly)

- <https://chrome.deib.polimi.it/index.php?title=Robotics>
- Webeep: 089013 - ROBOTICS (MATTEUCCI MATTEO) [2024-25]

Grading policy:

- Written examination covering the whole program up to
- ROS Home projects graded up to
- Final score will be the sum of the two grades ...

26/32



06/32



32/32

Deadlines to deliver it,  
valid for the academic  
year (no more).



## Alternative projects (instead of exam)

This year we plan to set up 2 teams of students participating to competitions

- Field Robot Event (<https://fieldrobot.nl/event/>) June 2025 in Milano
- Leonardo Drone Contest (<https://www.leonardo.com/en/innovation-technology/open-innovation/drone-contest>) October/November 2025

Organization of the teams (4-5 people per team)

- Supervised by a PhD Student / Researcher
- Led by Master Students doing their thesis on the topic
- Composed by 3-4 Students from the course

Grading policy:

- The project might replace second homework
- Written exam replaced by an oral exam with the teacher

Real Robots + ROS2 +  
physical event + ...

Homework 1 required  
anyway!





# Course material

Material available on the course website

- Check <https://chrome.deib.polimi.it/index.php?title=Robotics> (or WeBeep?)
- Slides from the teachers (not necessarily in advance, but you have last year ones)
- Link to online sources, books and papers
- Link to other websites for tools and digital resources

Past exams and sample questions

- Expect 3 theoretical questions + 2 practical exercises (on average)
- No coding exercise since you have it in the home project
- Few past exam examples are available on the course website

Do you need any further info?

