

CRAFT #0



Introduction to RobotCraft 2024

9th Robotics Craftsmanship International Academy

`<hello>`
`<world!>`



OBJECTIVES

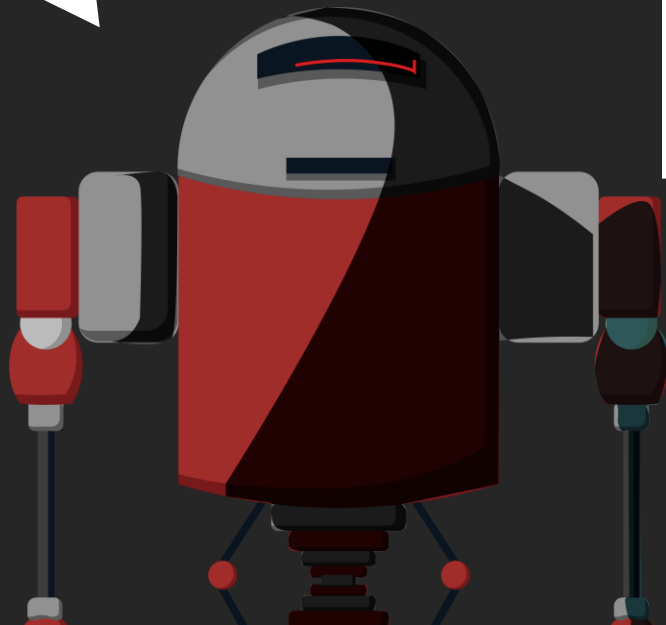
- Presentation of lecturers and students
- Welcome Package
- Presentation of RobotCraft 2024 and its crafts
- Presentation of the extra crafts

INTRODUCE YOURSELF!

**<hello>
<world!>**

Please, tell me:

- What's your name?
- Where are you from?
- What's your course and University?
- What motivated you to join us?
- What are your short-term and long-term objectives?



ROBOTCRAFT 2024 TEAM

NAME

Micael Couceiro

DEGREE

PhD, Electrical and Computer Engineering



SPECIALIZATION

- Mobile Robotics
- Swarm Intelligence
- Artificial Intelligence
- Sports Engineering

CRAFTS

- Introduction to Robotics
- Introduction to Programming
- Mobile Robotics Programming
- Artificial Intelligence

ROBOTCRAFT 2024 TEAM

NAME

André Araújo

DEGREE

MSc, Electrical and Computer Engineering

SPECIALIZATION

- Mobile Robotics
- Industrial Robotics
- ROS
- Firmware development



CRAFTS

- Mechatronics
- Robot Operating System

ROBOTCRAFT 2024 TEAM

NAME

Samuel Pereira

DEGREE

MSc, Automation and Communications in
Energy Systems

SPECIALIZATION

- Cloud Robotics
- Internet-of-Things
- Automation



CRAFTS

- Introduction to Programming
- Introduction to Linux

ROBOTCRAFT 2024 TEAM

NAME

Carlos Pizzino

DEGREE

MSc, Electrical Engineering

SPECIALIZATION

- Mobile Robotics
- Artificial Intelligence
- SLAM



CRAFTS

- Introduction to Linux
- Robot Operating System

ROBOTCRAFT 2024 TEAM

NAME

Panagiotis Karfakis

DEGREE

MSc, Robotics Engineering

SPECIALIZATION

- ROS
- Localization



CRAFTS

- Mobile Robotics Programming
- Robot Operating System

ROBOTCRAFT 2024 TEAM

NAME

Beril Yalçinkaya

DEGREE

MSc, Computer Engineering

SPECIALIZATION

- Robotics
- ROS
- Arduino Programming
- Unity



CRAFTS

- Introduction to Programming
- Mobile Robotics Programming
- Artificial Intelligence

ROBOTCRAFT 2024 TEAM

NAME

Lucas Costa

DEGREE

BSc student, Electrical Engineering

SPECIALIZATION

- ROS
- Unity
- Arduino Programming



CRAFTS

- ROS Simulation



WELCOME PACKAGE

- RobotCraft 2024 bag
- Ingeniarius' Pen
- Ingeniarius' Notebook
- Ingeniarius' USB flash
- Ingeniarius' bottle

MOODLE

Access all the content of the course (attendance, classes, homeworks, etc.)

- Go to:

<https://robotcraft.ingeniarius.pt/home>

- Use the following login:

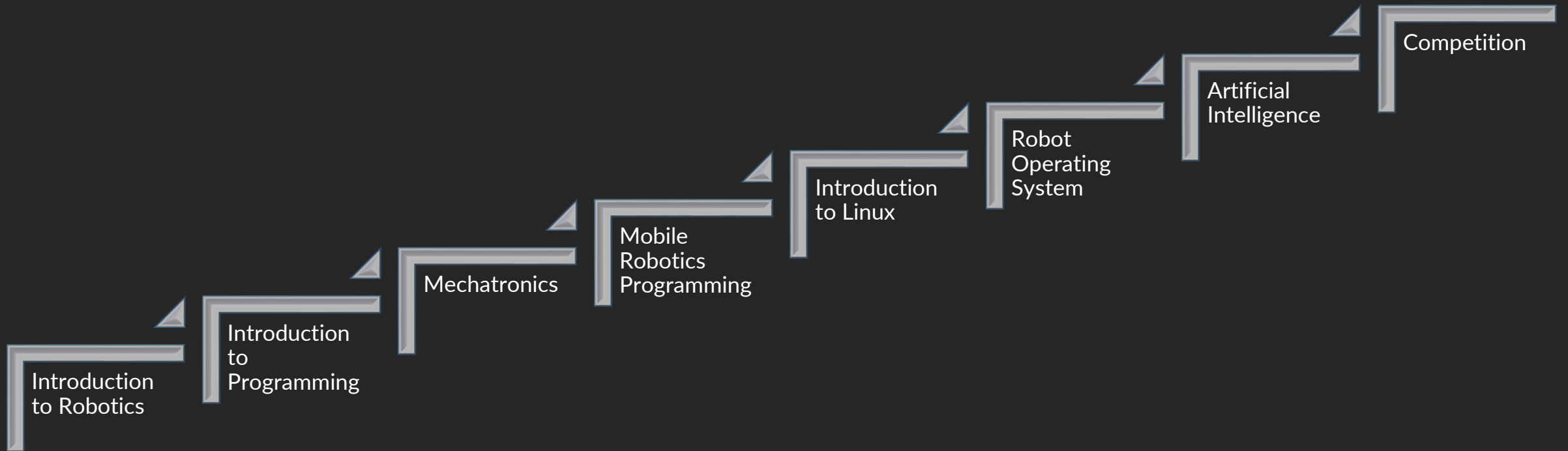
Username: <your e-mail>

Password: <your RobotCraft Registration password>

- Choose your group!



CRAFTS



CRAFTS

week #1

INTRODUCTION TO ROBOTICS

- ✓ Presentation of lecturers, mentors and interns
- ✓ Presentation of RobotCraft 2024 and the different crafts it comprises
- ✓ Introduction to robotics, describing the history of robotics and its evolution
- ✓ Presenting mobile robot morphologies, namely sensors and actuators
- ✓ Brief literature review related to robotics, presenting the necessary basic theoretical concepts



CRAFTS

week #1

INTRODUCTION TO PROGRAMMING

- ✓ *Introduction to C/C++ programming*

CRAFTS

week #2

MECHATRONICS

- ✓ Introduction to electromechanics in mobile robotics
- ✓ Electromechanical assembly of the mobile robotic platform



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week #3/4

MOBILE ROBOTICS PROGRAMMING

- ✓ Introduction to C language applied to Arduino programming
- ✓ Describe the features of Arduino solutions and ATMEL microcontroller (e.g., hardware architecture, cycles, pin configuration, communications), using the Arduino board
- ✓ Identify the different wireless communication technologies used in robotics (e.g., RF, Bluetooth, AdHoc, ZigBee)
- ✓ Introduction to low-level algorithms, flowcharts and pseudocode
- ✓ Acquire skills in the sensor and actuator practice used in robotics
- ✓ Develop a typical differential kinematic application using Arduino



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week #5

INTRODUCTION TO LINUX

- ✓ Introduction to *Linux OS*



CRAFTS

week #5/7

ROBOT OPERATING SYSTEM

- ✓ Introduction to *ROS*
- ✓ Describe *ROS* features (e.g., *stacks*, *publish-subscribe*, *topics*, *rosterial*), and provide specific examples and case studies
- ✓ Present *ROS*-compatible simulators, such as *Morse*, *Stage* and *Gazebo*
- ✓ Introduction to high-level algorithms, flowcharts and pseudocode
- ✓ Follow *ROS* tutorial under simulation environment
- ✓ Explore *rosterial* for *Arduino* – *ROS* communication
- ✓ Develop a typical robotic application using both *Arduino* and *ROS*

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week #8

ARTIFICIAL INTELLIGENCE

- ✓ Introduction to Artificial Intelligence, presenting different paradigms and some real applications
- ✓ Introduction and importance of integrating biologically-inspired models in robotics
- ✓ Formalizing a mobile robotic approach, devising biologically-inspired algorithms and finite-state machines
- ✓ Develop a streaming architecture to exchange all necessary data between Arduino and ROS (e.g., sensor readings, encoders readings, actuators control, etc.)



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week #9

ARTIFICIAL INTELLIGENCE

- ✓ Discussion of the competitive events, rules and prizes
- ✓ Consolidate concepts learned over all crafts and test the mobile robotic platform under a competitive scenario

TIME TO COMPETE!

Open Labs: 26th August to 30th August

Competition: 30th or 31st August

1. Compete against each other in Maze BASIC and PRO !
2. The winning team will be rewarded

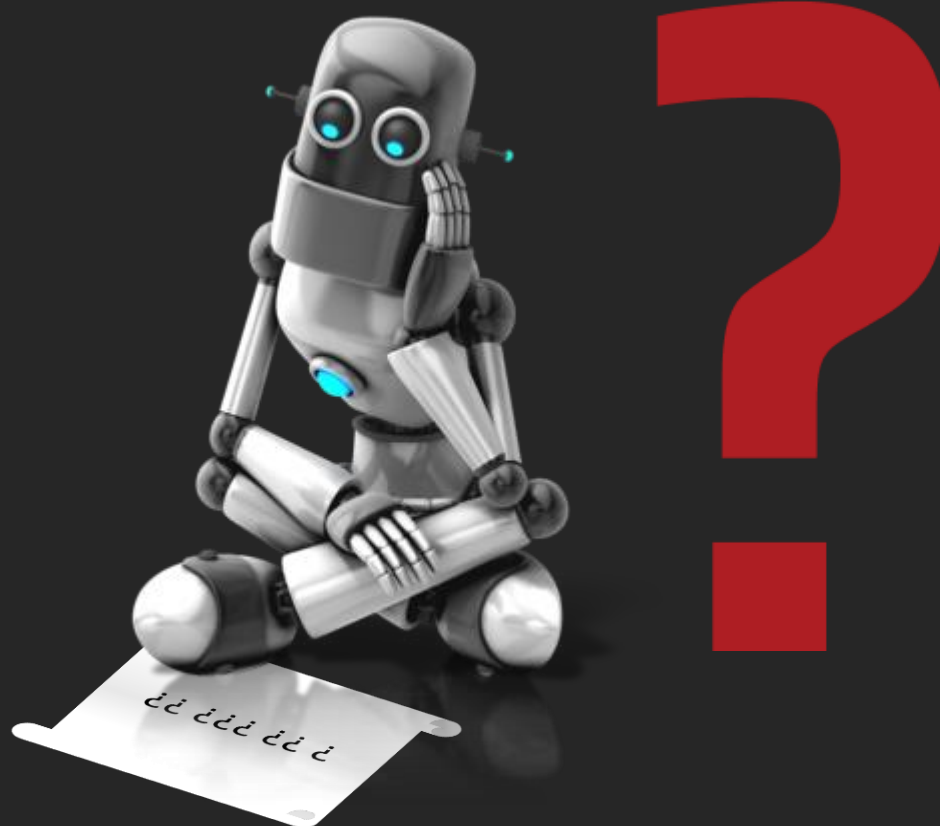


CONCLUSIONS

- The course will comprise the base disciplines of robotics, falling within the fields of electrical engineering, computer sciences and mechatronics
- Students will develop a small mobile robot that benefits from both *Arduino* and *ROS* frameworks
- The competition will allow to evaluate the developed platform, as well as its kinematics and *AI (maze solvers)*

#0 TASK

Diagnostic Test



CRAFT #0



Thank you

