INDUSTRIAL ROBOTICS

Code: 322096

Main Scientific Area: Tecnologic innovation

Lecturer: João Pedro Borges Araújo Oliveira Silva

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 48h

ECTS: 6,0

Objectives

The goal of this curricular unit is to provide the sutend with the fundamental concepts associated with the design and implementation of robot manipulators and mobile robots. In particular, kinematic modeling, trajectories planning, controlling robot manipulators position; and, in the settings, locomotion systems, sensory awareness, interpretation, localization and navigation of mobile robots. The student's theoretical training is complemented in the laboratory, through practical projecfts that integrate the different concepts that are covered.

Learning Outcomes

Students who successfully complete this course should be able to:

Understand the context and importance of robotics in the different sectors of society.
Obtain knowledge and understand the basics of robotics, in particular at the level of classification, operation, kinematics, sensing and actuation.
Design and plan robot manipulators.
Understand the basics of mobile robotics, at a hardware level, monitorization and supervision.
Understand and apply methods of awareness and sensory interpretation and methods of control of mobile robots.
Understand and implement methods that allow mobile robots to operate in known or unknown environments using planning and navigation algorithms.

Course Contents

1 Introduction.

2 Robots manipulators:

Introduction;
Components;
Types of joints;
Grippers;
Robot settings;
Types of actuation;
Safety;
Kinematics and dynamics analysis;
Offline and online robots programming.3 Autonomous mobile robotics:

Basic concepts;
Configurations;
Locomotion systems;
Sensors;
Localization;
Perception and sensorial interpretation;
Navigation;
Control of mobile robots;
World states representation;
Motion planning;
Typical applications.4 Development of simulation models for industrial robots.

Recommended Bibliography

"Robotics, vision and control", Peter Corke, Springer, 2011.

"Handbook of Robotics", B. Siciliano and O. Khatib (eds) Springer, 2008.

Matlab Primer R2015b https://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf

Matlab Creating Graphical User Interfaces R2015b http://uk.mathworks.com/help/pdf_doc/matlab/buildgui.pdf

LEGO MINDSTORMS EV3 Support from MATLABhttp://www.mathworks.com/hardware-support/lego-mindstorms-ev3-matlab.html?refresh=true

Virtual Robot Experimentation Platform (V-REP)http://www.coppeliarobotics.com/helpFiles/

Universal Robots UR3https://uracademy.universal-robots.com/dashboard/

Festo Robotino Wikihttp://wiki.openrobotino.org/index.php?title=Matlab

Learning and Teaching Methods

The syllabus were defined taking into account the objectives of the course. Therefore: the first objective is addressed in section 1 of the syllabus; objectives 2 and 3 are discussed in sections 2, 3 and 4 of the syllabus; the objectives 4, 5 and 6 are addressed in section 2 and 4 of the syllabus.

The objectives 2 to 6 shall also be developed in laboratory through the realization of work group and presentation of their outcomes.

Assessment Methods

The final grade of the students is obtained on the basis of the folowing elements:

•Practical Works: Projet and oral defense (individual)

–1º Work (TL1) – 10%

–2º Work (TL2) – 20%

–3º Work (TL3) – 30%

–Minimum meangrade: 9,5

•Writen tests – 40%

–1º Test (T1) – 20%

–2º Test (T2) – 20%

–Minimum meangrade: 9,5

Final Grade =(0,1(TL1)+0,2(TL2)+0,3(TL3)+0,2(T1)+0,2(T2))*0,75 + PBL*0,25

According to the equation of the normal season the student shall be approved in the CU when the grade is greater than or equal to 9,5. Otherwise the student may retake the exam in the recourse or special season, if they have obtained a minimum mean grade in the practical works.