IPG Polytechnic of Guarda School of Technology and Management	**SUBJECT DESCRIPTION**	MODELO PED.013.02

Course	**Mechanical and Industrial Informatics**			*Academic year*	2021/2022		
Subject	**Robotic Systems**			ECTS	6,5		
Type of course	**Compulsory**						
Year	**3rd**	*Semester*	**2nd**	*Student Workload:*			
Professor(s)	**Carlos Alberto Correia Carreto**			*Total*	175,5	*Contact*	60
Area Coordinator	**Fernando José dos Santos Melo Rodrigues**						

Planned SD

1. LEARNING OBJECTIVES

Upon completion of curricular unit, students should be able to:
1. Describe the different types of industrial robots and their basic operation.
2. State and explain the fundamental aspects of modeling, analysis and control of industrial robots.
3. Program industrial robots to perform simple tasks.

2. PROGRAMME

1. Fundamentals of Robotics: Robot Basics; History; Industrial Robot Applications; Topology and components of industrial Robots.
2. Kinematic modeling of manipulative robots: Reference systems and coordinate transformation; Direct and inverse kinematics; Singularities; Trajectory generation.
3. Dynamic modeling of manipulative robots: Numerical methods; Position control and force control.
4. Automatic Guided Vehicles (AGV): Technologies and navigation methods.
5. Robotic systems programming: Task programming; Programming methods; Programming languages; Offline programming.
6. Robotic systems programming project.

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

Content 1 allows to achieve objective 1, as it presents the fundamentals of industrial robotics.
Objective 2 is achieved by combining all programme contents as they help students to understand the fundamental aspects of the operation of industrial robots.
Objective 3 is achieved by contents 5 and 6 that lead students to carry out a practical project of programming industrial robots and apply the knowledge acquired in the curricular unit.

4. MAIN BIBLIOGRAPHY

J. Norberto Pires (2018), ROBÓTICA INDUSTRIAL – Indústria 4.0, LIDEL Publisher. ISBN: 978-989-752-226-0.

Kevin M. Lynch e Frank C. Park (2017), Modern Robotics: Mechanics, Planning, and Control, Cambridge University Press. ISBN: 978-110-715-630-2.

Hamed Fazlollahtabar e Mohammad Saidi-Mehrabad (2015), Autonomous Guided Vehicles: Methods and Models for Optimal Path Planning, Springer. ISBN-13: 978-331-914-746-8.

Peter Corke (2017), Robotics, Vision and Control: Fundamental Algorithms In MATLAB, Second Edition, Springer, ISBN: 978-331-954-412-0.

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

Teaching Methodologies:
1. Lectures
2. Interactive Classes
3. Problem Solving
4. Project Work

Evaluation Methodologies:
1. Written test 60%
2. Project 40%

Mean grade equal to or higher than 10 values to obtain approval, with 20 being the highest grade possible.

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

Expositive lectures are consistent with the objectives due to the need to present the theoretical contents to students, so that they acquire a comprehensive and solid knowledge about robotic systems.
Interactive classes are consistent with the objectives as student participation in practical demonstrations of technological solutions and case studies will help them to understand the contents studied, with an emphasis on “how it is done”.
Problem Solving is consistent with the objectives as solving practical exercises, based on the application of the studied contents will help students to consolidate the acquired skills, with an emphasis on knowing “how to do”.
Project work is consistent with the objectives as it provides the context for students to consolidate the knowledge and skills they have acquired through the design and implementation of technological solutions to realistic professional life problems.

7. ATTENDANCE

N.A.

8. CONTACTS AND OFFICE HOURS

Professor: Carlos Alberto Correia Carreto (Ph.D); ccarreto@ipg.pt; office n.º 12

Area Coordinator: Fernando Melo Rodrigues; fmr@ipg.pt; office n.º 24

Date: 30/06/2021