6.a Robotics programming (set up automotive robot) assembly and manufacturing robots, collaborative robots

Functional Area: R&D

Pre-Requisites:

Fundamentals of kinematics

Fundamentals of dynamics

Fundamentals on electric motors

Assessment criteria	Knowledge
LO6a.1. Recognizes different types of robots and/or motion control systems, identifying the components that form them and **determining their applications in industrial automation** Starting from a given task that a robot has to perform the student will describe: • How to accomplish the task using Parallel and/or Serial mechanisms • What are stable and unstable systems and the influence of those on the task to perform • Feedforward and feedback approaches to accomplish the tasks	• Planar Parallel and Serial linkages/mechanisms • Spatial Parallel and Serial linkages/mechanisms • Concept of stability of a system • Feedforward control Feedback control • Fundamentals on Motion Lows • Difference between robot and cobot • Methods for program commercial robots and cobots • Languages for program commercial robots and cobots • Fundamentals of Teleoperational and remote robotic • Safety aspects of Robots and Cobots
LO6a.2: Configures robotic and/or motion control systems, selecting and connecting the component elements.	**Skills**
Starting from a given task that a robot has to perform the student will describe: • Trajectory of end-effector • Sequence of displacements of the different joints • Motion Laws graphs (displacement and velocity vs time Starting from a given task that a robot has to perform the student will describe the	• Understand the difference between parallel and serial mechanisms. Pros and cons of booth architectures and ability to choose when to use a parallel kinematic and when a serial one. • Define a stable or unstable behavior of a robot (from a time-displacement representation) • Represent the behavior and the trajectories of the joints and the end-effector of a robot. • Understand a motion low description and representation (displacements and velocity vs time)

algorithm and create the code needed to program the robot/cobot • Open questions on Remote controlling, tele operational and Safety aspects • Practical tasks on programming robots	• Program robots for base tasks as sequential single joints movements • Program robots for base tasks as multiple joints movements • Ability to calculate the working space of a robot in particular for designing the safety spaces • How to setup a robot/cobot for maintenance process
	Transferable skills
	• Understand descriptions, specifications and documentations of commercial robots (in English) • Ability to communicate the designed behavior of a robot/cobot