Hanze

Vak: Robot Systems — credits: 5

Vakcode	ELVB25RBS
Naam	Robot Systems
Studiejaar	2025-2026
ECTS credits	5
Taal	Engels
Coördinator	F. Martins
Werkvormen	Hoorcollege Practicum / Training Simulatie
Toetsen	Robot Systems - Opdracht

Leeruitkomsten

Design
The starting professional considers various solutions in order to arrive at a detailed and well-founded (electro)technical product/service/process based on the program of requirements, using appropriate design methods and taking social interests and engineering standards into account.

Realisation
The starting professional realizes and validates a (prototype of a) product/service/process based on an (electro)technical design and makes appropriate use of materials/techniques/instruments.

Inhoud

This module deals with industrial robotics, automation and industrial communication networks. It treats programming robot manipulators to work on automated industrial settings. It goes into specification and application of different networks for transferring data in an industrial environment and treats PLCs for industrial automation and robotics.

Professional Products

- Mechatronic calculations and simulations – Analytical and virtual methods used to predict and evaluate the behaviour and performance of integrated mechanical, electrical, and control systems. Calculations involve formulas and models to determine parameters like force, torque, current, or speed, while simulations use software tools to visualize and test system dynamics, control responses, and interactions before physical implementation. *In this module: Robot simulations*
- Software for mechatronic systems – The programming and control algorithms that integrate mechanical, electrical, and computational components to enable the functionality and coordination of mechatronic systems. It includes software for sensor data processing, actuator control, system monitoring, and user interface, ensuring seamless operation across all system parts. *In this module: for (industrial) robots (for example pick and place, force control, person or other robot collaboration) and PLC programs*

Skills

- Configuring and programming a robot – The process of setting up hardware parameters and writing control software to define the robot's behavior, movements, and interactions. It involves tasks such as calibrating sensors and actuators, defining motion paths, implementing logic or AI, and integrating the robot into its intended environment or system.
- Mechatronic calculating and simulating – The process of using mathematical methods and software tools to analyze, model, and predict the behavior of systems that integrate mechanical, electrical, and control components. It supports design, optimization, and validation by evaluating system performance, dynamics, and interactions before physical implementation. *In this module: Robot simulations*
- Selection of robot systems – The process of choosing appropriate robotic technologies—such as manipulators, mobile robots, or collaborative robots—based on application requirements, including payload, precision, workspace, control system, and integration needs, to ensure optimal performance and efficiency in a given task or environment.

Knowledge

- Industrial Robot and PLC communication – The exchange of data and control signals between a robot and other devices or systems—such as sensors, PLCs (Programmable Logic Controllers), controllers, and manufacturing equipment—using standardized protocols (e.g., Ethernet/IP, PROFINET, Modbus). This communication enables coordinated operation, real-time monitoring, and seamless integration within automated industrial environments.
- (Industrial) Robot monitoring and control – The process of supervising and managing a robot's operations in real time to

ensure accurate, safe, and efficient performance. This includes tracking system data, diagnosing issues, and adjusting commands. In industrial settings, this is often integrated with SCADA and DCS, which provide centralized oversight, data logging, and coordinated control across multiple machines and processes.

- Robot simulation – The use of virtual models and software tools to design, test, and optimize a robot's movements, tasks, and interactions in a digital environment. This can include topics like degrees of freedom, the kinematic model, modelling software, teach pedant and offline programming.
- Robot configuration – A robot's parameters to ensure it performs tasks accurately and efficiently. This includes defining the TCP (Tool Center Point) position and orientation, selecting the appropriate tool mass, and adjusting parameters like speed, acceleration, and range of motion.
- Basic automation – The use of technology to perform simple, repetitive tasks or processes with minimal human intervention. It typically involves sensors, actuators, and control systems—such as PLCs—to improve efficiency, accuracy, and consistency in industrial or manufacturing environments.
- PLC languages – Standardized programming languages used to develop control logic for Programmable Logic Controllers (PLCs). Defined by the IEC 61131-3 standard, they include languages such as Ladder Diagram (LD), Function Block Diagram (FBD), Structured Text (ST), Instruction List (IL), and Sequential Function Chart (SFC), each suited to different types of automation tasks and user preferences

Opgenomen in opleiding(en)

Exchange Mechatronics (spring)
Minor Mechatronics

School(s)

Instituut voor Engineering

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