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SICK AND UNIVERSAL ROBOTS 2D VISION PACKAGE FOR EDUCATION

Post-secondary level courses for schools

SICK

Sensor Intelligence

This post-secondary level course is designed to equip learners with the skills and knowledge required to work with 2D vision systems in industrial robotics. Through a combination of lectures and hands-on labs, students will gain proficiency in vision-guided automation applications like pick-and-place and belt-picking.

Target Audience

Students ages 16 and up who are interested in robotics, vision, automation, and industrial applications.

Course Duration

22-24 hours

Course Type

In-person

Course Release Date

The 2D Vision for Industrial Robotics course will be available starting November 3, 2025.

Course Prerequisites

- Familiarity with the UR Robot, controller, teach pendant, and basic UR programming is required (taking the UR Core Course first is required).
- The course is beginner friendly.

About the Course

Equip students with the knowledge and hands-on experience to design, implement, and troubleshoot 2D vision systems for industrial robotics, focusing on applications like pick-and-place and belt-picking, while preparing them to work with industry-like setups and solve real-world automation challenges.

KEY FEATURES

- **Comprehensive Curriculum:** Six modules that cover foundational 2D vision theory, guide students through hands-on setup of the SICK PLOC2D with a UR robot for guidance tasks, and progress to advanced skills such as conveyor tracking for dynamic part picking.
- **Hands-On Labs:** Practical sessions with industry-like setups including a UR robot, SICK PLOC2D camera, conveyor etc to reinforce concepts.
- **Real-World Applications:** Exposure to real-world scenarios, applications, systems, and challenges.
- **Quizzes:** Knowledge checks throughout the course, culminating in a graded quiz to test understanding and proficiency.
- **Capstone Project:** A final project to integrate and apply all learned concepts.
- **Certificate of Completion:** Students receive a certificate upon passing the final assessment.



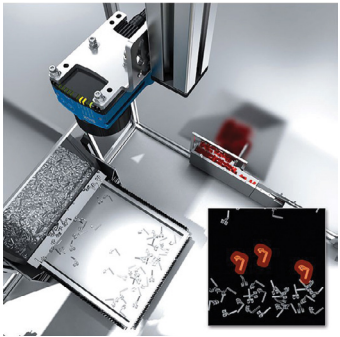
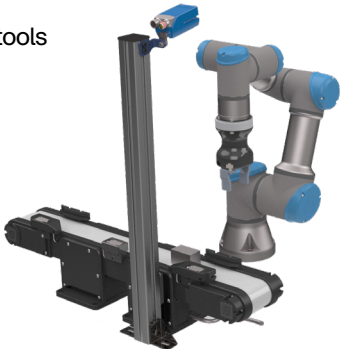
WHAT STUDENTS WILL GAIN

- A solid understanding of 2D vision systems and their role in industrial automation.
- Hands-on skills for camera setup, calibration, alignment, tuning and integration.
- Experience in troubleshooting and optimizing 2D vision applications.
- Insights into advanced topics like conveyor tracking.
- Learn to work with cutting-edge industrial tools like the SICK PLOC2D camera and the UR robot, ensuring readiness for the world of automation and robotics.
- **Career Advancements:** Master skills that are high in demand across industries like automotive, logistics, manufacturing, and quality assurance. Gain a competitive edge for roles such as robotics engineer, vision specialist, and automation technician.
- **Foundation for Further Studies:** Build a strong foundation in vision-guided robotics, ideal for those planning to pursue advanced studies in robotics, automation, or related fields.

WHAT'S INCLUDED IN THE KIT

The course kit provides all the necessary tools and components for hands-on learning in 2D vision-guided robotics, including:

- **SICK PLOC2D Camera:** Industry-standard 2D vision camera for imaging and localization.
- **Alignment target:** Targets for camera-robot hand-eye alignment.
- **Cabling and Mounts:** Essential cables like ethernet, power cable etc and mounts for seamless setup.
- **Lighting Options:** Red and blue lights to experiment with imaging under varying light conditions.
- **Variety of Test Parts:** A range of shiny, matte, and other unique parts to test and analyze 2D vision performance.
- **Educational Curriculum:** Comprehensive modules, quizzes and step-by-step lab activities for guided learning.



The 2D vision kit is compatible with any UR e-Series cobot.

COURSE MODULES

MODULE 1: Introduction to 2D Vision

Purpose: Introduce students to the world of 2D vision technology, its role in automation, and its real-world impact.

Key Learning Goals:

- > Understand what 2D vision is and how it works.
- > Recognize its characteristics and the type of information it captures.
- > Identify real-world examples in everyday life and industrial automation.
- > Discuss the advantages.

MODULE 2: Fundamentals of 2D Vision

Purpose: Build a deep understanding of 2D vision components like cameras, lenses, lighting, and imaging parameters.

Key Learning Goals:

- > Learn how cameras, lenses, and lighting affect image quality.
- > Understand terms like focal length, FOV, resolution, exposure, brightness, gain, and contrast.
- > Learn frame transformations and coordinate systems.
- > Recognize communication protocols and part feeding systems.

MODULE 3: SICK PLOC2D Camera

Purpose: Introduce the SICK PLOC2D camera and its hardware, software, and calibration procedures.

Key Learning Goals:

- > Describe the hardware, components, and interface of the PLOC2D camera.
- > Demonstrate camera mounting, setup, and calibration, including experimenting with different colored lighting.
- > Tune imaging settings for different types of parts (glossy, matte).



MODULE 4: Part Localization Using 2D Vision – Pick and Place

Purpose: Demonstrate how to use 2D vision for part localization and robot-guided pick-and-place applications.

Key Learning Goals:

- > Integrating PLOC2D with UR robots: network setup, URCap installation, and configuration workflow
- > Performing camera-robot alignment, job configuration, and creating a pick and place program.

MODULE 5: Part Localization Using 2D Vision – Belt Picking

Purpose: Expand learning to conveyor belt applications and synchronization of 2D vision with moving parts.

Key Learning Goals:

- > Understand conveyor synchronization with vision systems.
- > Set up and troubleshoot a conveyor tracking system.
- > Learn the advantages and challenges of belt-picking systems.

MODULE 6: Course Wrap-Up

Purpose: Integrate all concepts in a real-world capstone project to reinforce learning.

Key Learning Goals:

- > Recap key concepts.
- > Complete capstone project combining all learned skills.
- > Pass the graded quiz and receive a certificate of completion.

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SICK AT A GLANCE

SICK is a globally leading company in intelligent sensors and sensor solutions. With over 10,000 employees, more than 60 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its customers.

With a unique range of products and services for factory and logistics automation, SICK creates added value along the entire value chain of its customers. In addition, SICK brings extensive industry and application experience as well as a deep understanding of its customers' processes and requirements.

Partnering for the better, optimizing productivity, elevating quality, and protecting health and safety – this is what SICK stands for.

THAT IS “SENSOR INTELLIGENCE”.

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 **UNIVERSAL ROBOTS**