

Certificate-Registration-No.
AK023-32017-10103

Name **Ashwin Chakravartula**

Executing Institution Chair and Institute of Mechanism Theory, Machine
Dynamics and Robotics (IGMR)

Title of Certificate **Robot Operating System (ROS)**

Period of Execution May 13 to 17, 2024

Topics

- ROS Basic Functionalities - File Structure and roscore
- ROS Basic Communications - Messages and Topics
- ROS Basic Communications - Services and Actions
- Control serial robots with moveit
- Project Work & Application (welding task including AR-Tag recognition)

Final Examination successfully completed


Credit Points according to the
European Credit Transfer System (ECTS) 2 (50h Workload)

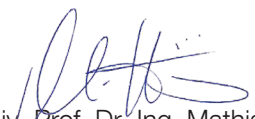
Level of Qualification according to the
European Qualification Framework (EQF) Level 7 (Master)



Aachen, May 17, 2024


Dr. rer. oec. Helmut Dinger
Managing Director
RWTH International Academy gGmbH


Univ.-Prof. Dr.-Ing. Dr. h. c. Burkhard Corves
Head of Institute
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Univ.-Prof. Dr.-Ing. Mathias Hüsing
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Certificate Supplement Robot Operating System (ROS)

Course Content

- ROS Architecture
- ROS Launch System
- ROS Communication
- ROS Visualization
- ROS Packages
- ROS Robotics
- ROS Nodes
- ROS Ecosystem
- ROS Topics
- ROS Best Practices
- ROS Services
- ARTags and camera systems
- Universal Robot Cobots

Learning Objectives

Overall goal: students gain knowledge on the following principles.

Knowledge / Understanding

Students

- Have an understanding of the ROS Architecture: They understand the layered architecture of ROS and how different components interact with each other
- Understand the concept of nodes and their role in ROS, including how to create, run, and manage nodes,
- Understand the client-server model of ROS services and how to use them for request-response interactions,
- Get familiar with the ROS ecosystem, including popular ROS packages and libraries for various robotics applications,
- Know how to create, organize, and manage ROS packages, which are the basic unit of software in ROS,
- Discover the ROS launch system and its capabilities for launching multiple nodes and configuring the ROS environment,
- Are familiar with UR Robots (Cobots).

Abilities / Skills

Students

- Explore the publish-subscribe mechanism of ROS topics and how to use them for data sharing among nodes,
- Identify and transfer the best practices for developing efficient, modular, and maintainable code using ROS,
- Classify different robotic structures,
- Detect AR Tags from camera data and use them to control robots,
- Have the following associated skills Robotic Systems, Advanced Robotics, Physics, Ubuntu (Operating System), Open-Source Software.

Competencies

Students

- Apply, move and control Universal Robots (Cobots) with ROS,
- Handle the ROS launch system and its capabilities for launching multiple nodes and configuring the ROS environment,
- Apply tools like RViz and RQT for visualizing and debugging ROS data, topics, and services,
- Apply the learned concepts to build and control a simple robot using ROS, including topics like robot modeling, control, and navigation.