Real Time College

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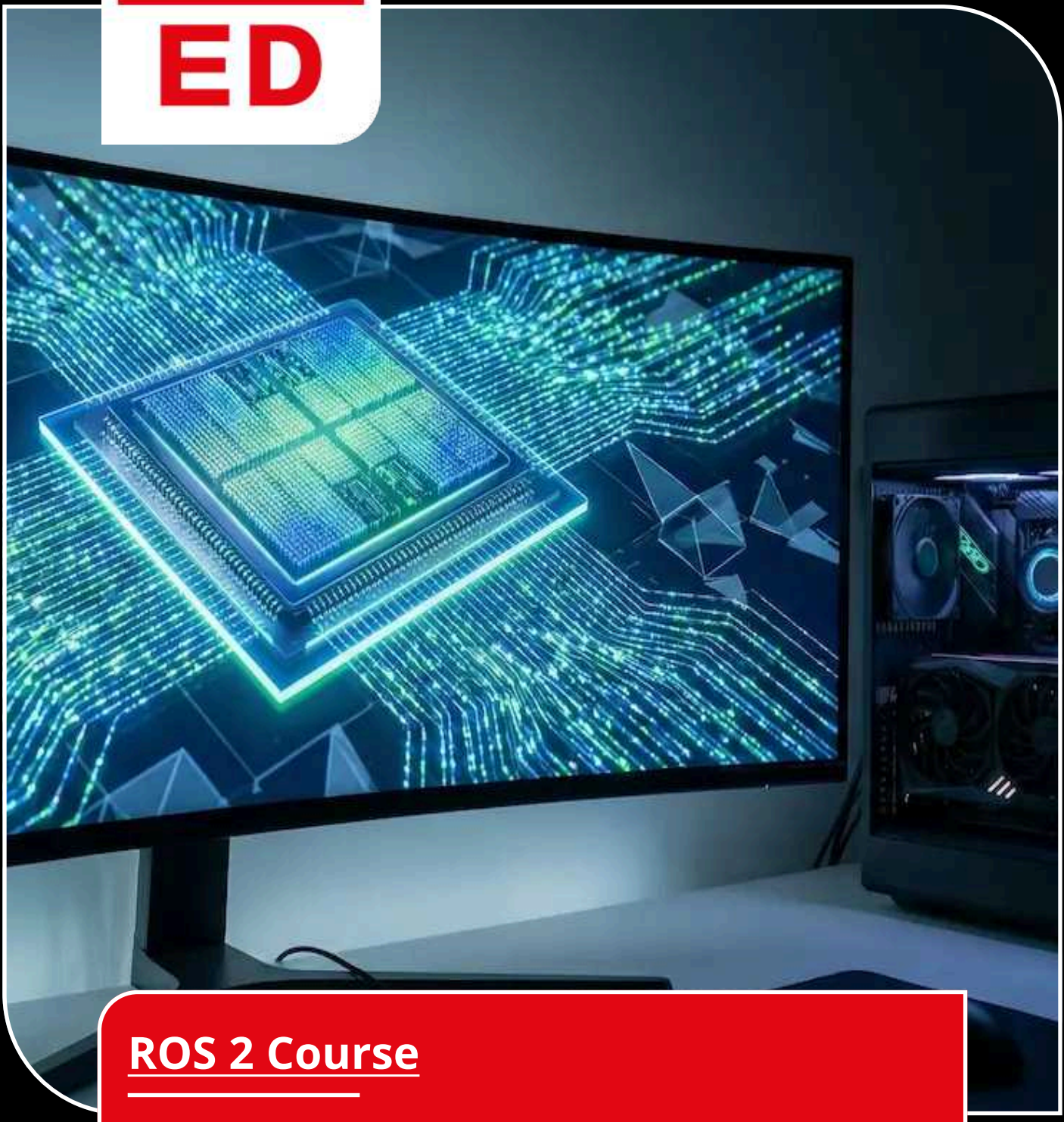

ROS 2 Course

Duration: **30** Hours | **Hands-On Training:** 65%

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ABOUT REAL TIME GROUP

Experience the Industry. Master the Technology.

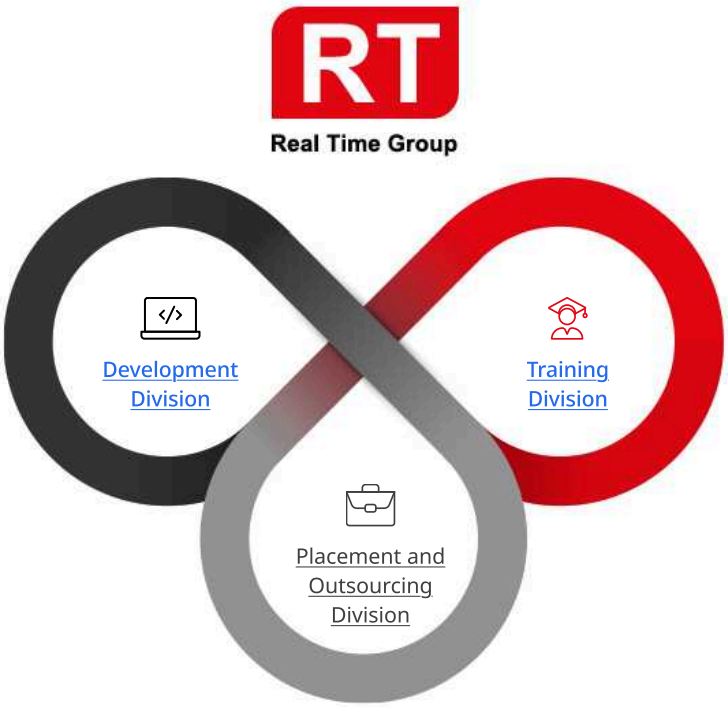
Real Time Group, established in 2007, is a technology company specializing in advanced software and hardware engineering solutions across RT Embedded Systems, Embedded Linux, FPGAs, Artificial Intelligence, Machine Learning, Computer Vision, DevSecOps, Cloud technologies, and Full Stack development.

The company combines deep hands-on development expertise with professional training programs designed to prepare engineers for the high-tech industry. Over the past two decades, Real Time teams have contributed to complex engineering projects for leading organizations including Apple, NVIDIA, Intel, the Israel Defense Forces (IDF), Rafael Advanced Defense Systems, Israel Aerospace Industries (IAI), Elbit Systems, and ELTA Systems.

This industry-driven experience forms the foundation of the Real Time training ecosystem.

OUR THREE-DIVISION ECOSYSTEM

Working together to launch your career:



RT-ED: TRAINING DIVISION

RT-ED provides advanced professional training programs focused on practical engineering skills. Courses are project-based and utilize industry-standard development environments, cloud platforms, and modern development tools.

Participants gain hands-on experience through structured labs, guided exercises, and industry-grade final projects.

DEVELOPMENT DIVISION

The Development Division delivers engineering and software development services across embedded systems, AI technologies, cybersecurity, and cloud infrastructures.

Through interaction with development teams and real-world workflows, students gain exposure to modern engineering practices and production-grade environments.

PLACEMENT AND OUTSOURCING DIVISION

Real Time Group provides structured placement and internship opportunities that support graduates in transitioning into the high-tech industry.

Students may participate in internships within active development teams, gaining real-world project experience under the guidance of experienced engineers and mentors.

COURSE OVERVIEW

ROS 2 – Distributed Robotics & Autonomous Systems Engineering

The **ROS 2 course** provides advanced, hands-on training in designing and developing modern distributed robotic systems using the ROS 2 middleware.

The course focuses on building scalable, real-time, and production-ready robotic software architectures.

Participants will learn how to:

- Design modular ROS 2 systems
- Build distributed communication pipelines
- Integrate sensors and actuators
- Manage coordinate frames and transformations
- Implement navigation and SLAM pipelines
- Optimize system performance and reliability

ROS 2 is the industry-standard middleware for robotics, designed for real-time performance, secure communication (DDS-based), and large-scale industrial deployment.

This course emphasizes **clean architecture, deterministic behavior, and system-level engineering principles** required for autonomous robotic platforms.

WHO SHOULD ATTEND\ PREREQUISITES

Who should attend:

- Robotics Engineers
- Autonomous Systems Developers
- Embedded Software Engineers
- C++ Developers entering robotics
- AI Engineers integrating perception into robots

Prerequisite/Advantage:

- C for Embedded Systems
- Modern C++ Programming

COURSE CURRICULUM

Below is a breakdown of the core modules covered in this course, along with their descriptions and duration.

Select a module to view detailed content.

MODULE NAME	DESCRIPTION
Day 1 **ROS 2 Core Architecture & Communication**	**System Fundamentals** • ROS 2 graph model: Nodes, Topics, Services, Actions • Parameters and lifecycle concepts • DDS middleware architecture (vs ROS 1 master model) **Development Environment** • Workspaces and overlays • ament_cmake package structure • package.xml & CMakeLists.txt • Build, install, and sourcing **Debugging & Inspection Tools** • ros2 node / topic / service / param • rqt_graph • Logging & runtime configuration • QoS policies (reliability, durability, history, depth)
Day 2 **System Bringup & Architecture Design**	• Launch files and multi-node orchestration • Namespaces and remapping • YAML-based parameter management • Runtime parameter updates • Composition for low-latency systems • Project organization & naming conventions Focus: Designing clean, scalable robotic software architectures.

MODULE NAME	DESCRIPTION
Day 3 **Frames, Transforms & Odometry (TF2)**	**Coordinate Systems** • base_link, odom, map, sensor frames • Static vs dynamic transforms **TF2 Core Concepts** • TransformBroadcaster • TransformListener • Transform buffer & timeout handling • Time synchronization and header.stamp importance **Odometry Fundamentals** • nav_msgs/Odometry structure • Differential drive kinematics • Drift and covariance **Visualization Tools** • tf2_echo • view_frames • RViz TF configuration
Day 4 **Sensor Integration & Data Pipelines**	**Laser & Vision Data** • sensor_msgs/LaserScan • sensor_msgs/Image • CameraInfo correctness • image_transport (raw vs compressed) **QoS for Sensors** • SensorDataQoS profiles • Reliable vs Best Effort • Blocking behavior in pipelines **Data Processing** • Range clipping & angle cropping • Downsampling & filtering • rosbag2 recording & playback Focus: Building reliable real-time sensor pipelines.

MODULE NAME	DESCRIPTION
Day 5 **Navigation, SLAM & System Safety**	**SLAM & Mapping** • Mapping vs localization • Evaluating map quality • slam_toolbox integration **Navigation 2 (Nav2)** • Planners • Controllers • Costmaps • Robot footprint & inflation **Lifecycle Nodes** • Configure / Activate / Deactivate • Why lifecycle management matters in production **Safety Layers** • Velocity multiplexing • Timeout monitoring • Deadman switches • Emergency stop mechanisms
Day 6 **Performance & System Optimization**	• FPS, latency, queueing • Measuring performance correctly in ROS 2 • QoS tuning for image streams • Behavior under packet loss • Frame consistency & visualization issues
Day 7 **Optional Advanced Integrations**	• OpenCV integration for vision overlays • Image resizing & encoding conversion • Gimbal control via services • Rate limiting & safety constraints

MEET YOUR INSTRUCTOR

ALEX SHOYHIT

Head of Machine Learning Departments

Alex holds a B.Sc. in Information Systems and an M.A. in Electrical and Electronic Engineering. As a ML Engineer at RTG, Alex specializes in the field of artificial intelligence, applying over 13 years of experience in project development, management, and transitioning from development to production in various domains such as Linux Embedded. Throughout his career, Alex developed his expertise working with the integration of Machine Learning and Deep Learning in Computer Vision & Data Analysis field.

What Do The Course Graduates Say?

Grisha
Data Science
Course Graduate

I highly recommend the Data Science course at RTG College for anyone looking to enter the field. The small groups, personal attention, and emphasis on real projects gave me a significant advantage in job interviews.

Binyamin
Data Science
Course Graduate

Within a few months, I acquired practical tools that enabled me to integrate into my first position at a tech company, with a significantly increased salary. The industry-experienced instructors and practical projects made all the difference.

Shaked
Full Stack Course
Graduate

The Tools I Gained From The Course Are Among The Most Up-To-Date In The Development Market Today. What Gave Me Peace Of Mind Was Knowing That At The End Of The Course, A Professional Placement Company Would Support Me In Entering The Field

MISCELLANEOUS

• Course opening is contingent upon minimum enrollment.

• Registration fees are non-refundable except in cases where the college does not open the course.

• All content and implications of the syllabus are subject to college regulations.

• The college informs students that there may be changes in course content and scheduling.

• The college commits to notifying students of any changes.

• The college reserves the right to modify course content at its sole discretion.

Thank You!

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