Real Time College

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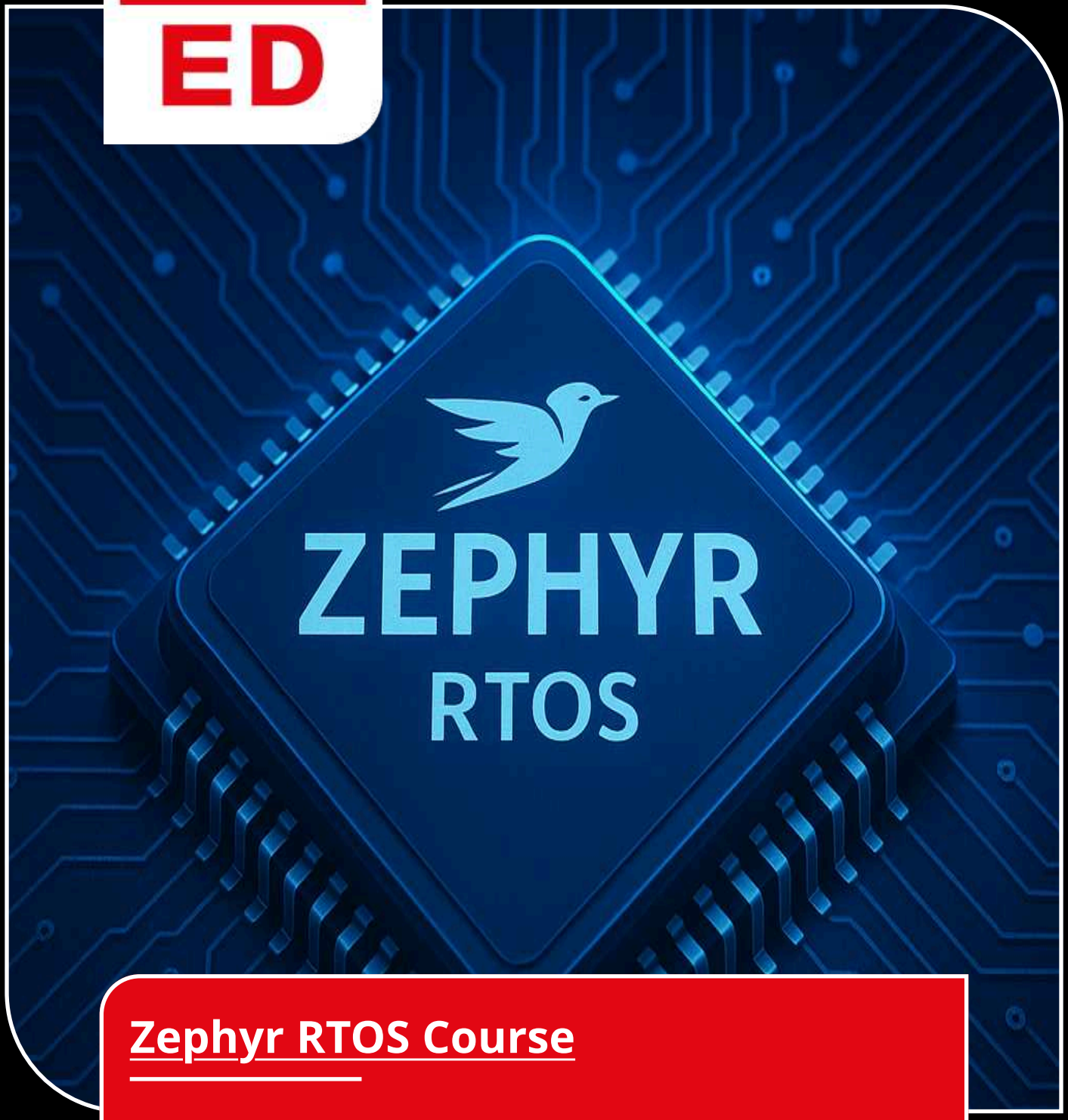

Zephyr RTOS Course

Duration: 40 Hours | **Hands-On Training:** 65%

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ABOUT REAL TIME GROUP

Experience the Industry. Master the Technology.

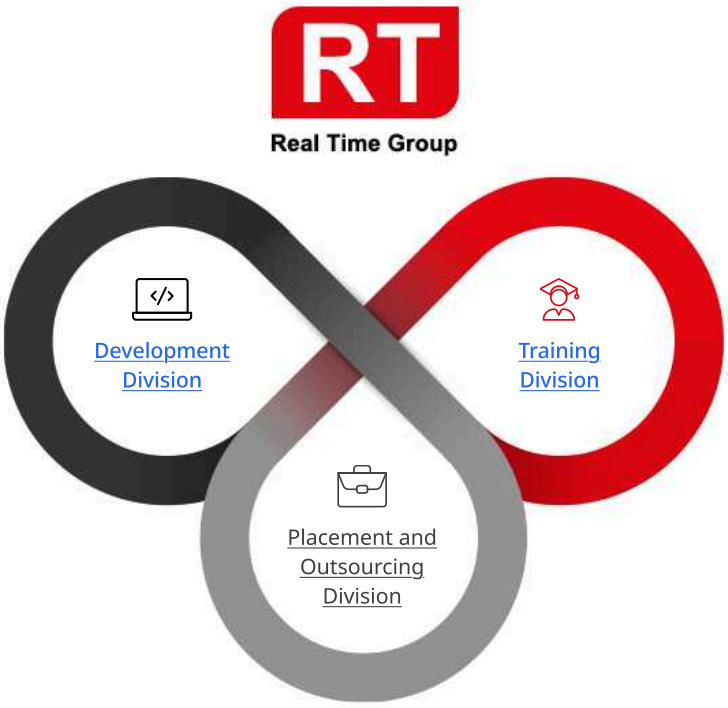
Real Time Group, established in 2007, is a technology company specializing in advanced software and hardware engineering solutions across RT Embedded Systems, Embedded Linux, FPGAs, Artificial Intelligence, Machine Learning, Computer Vision, DevSecOps, Cloud technologies, and Full Stack development.

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:

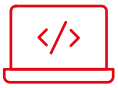


RT-ED: TRAINING DIVISION

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

The Zephyr RTOS course provides in-depth, hands-on training for one of the fastest-growing operating systems in the embedded world. Zephyr is an open-source Real-Time Operating System (RTOS) managed under the Linux Foundation. It was specifically designed for resource-constrained devices but is built with a scalable architecture that allows it to run on more complex systems as well.

Unlike traditional RTOS solutions that are often just a basic kernel, Zephyr arrives as a complete platform ("Batteries Included"). It includes drivers, advanced communication stacks, and file systems – all under the permissive Apache 2.0 license, making it ideal for commercial product development without legal concerns.

WHO SHOULD ATTEND\ PREREQUISITES

Who should attend:

- Embedded and Firmware developers
- Electronics / Software engineers
- Developers looking to transition from FreeRTOS or bare-metal
- IoT, BLE, and hardware product engineers
- Computer Science / Engineering graduates interested in learning a modern RTOS

Prerequisite/Advantage:

- Basic knowledge of the C programming language
- Familiarity with microcontrollers (STM32, ESP32, Nordic)
- Advantage: Familiarity with RTOS
- Advantage: Experience with VSCode, GDB, or similar debugging tools

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
Introduction	(a) What is Zephyr (b) Features (c) System architecture (d) Installing toolchain and SDK
The Zephyr Toolchain	(a) What is Zephyr (b) Features (c) System architecture (d) Installing toolchain and SDK Lab Exercise-1: Build, flash and run your first zephyr app Lab Exercise-2: Test and debug zephyr apps
Building Zephyr Apps	(a) Structure of a Zephyr app (b) Types of apps (c) Core kernel header (d) System utility headers (e) Logging system (f) System data structures (g) Error handling (h) Coding style Lab Exercise-3: Create a new Zephyr app from scratch

MODULE NAME	DESCRIPTION
Using Hardware Peripherals	(a) Intro to using hardware drivers with Zephyr (b) GPIO (c) ADC/DAC (d) Timers/PWM (e) UART (f) SPI (g) I2C Lab Exercise-4: Using GPIO Lab Exercise-5: ADC-DAC Conversion Lab Exercise-6: Timers & LED PWM Lab Exercise-7: Send and receive data using UART Lab Exercise-8: Send and receive data using SPI Lab Exercise-9: Send and receive data using I2C
Multithreading With Zephyr	(a) Thread lifecycle & states (b) Zephyr scheduling (c) Thread priority (d) Thread creation Lab Exercise-10: Creating and destroying threads Lab Exercise-11: Priority and scheduling demonstration
Thread Synchronization	(a) Mutex (b) Semaphore (c) Condition Variable

MODULE NAME	DESCRIPTION
Inter-Thread Communication	(a) Queues (b) Stacks (c) Message Queues (d) Mailboxes (e) Pipes Lab Exercise-10: Creating and destroying threads Lab Exercise-11: Priority and scheduling demonstration Lab Exercise-12: Inter-Thread Communication
Creating Device Drivers	(a) Zephyr device driver model (b) Devicetree and binding (c) Driver Implementation (d) Kernel initialization levels Lab Exercise-13: Creating custom drivers
Networking	(a) Network Stack Architecture (b) Socket API (c) Wireless protocols: Bluetooth, LoRa (d) Application protocols: MQTT, CoAP Lab Exercise-14: Secure MQTT over Wi-Fi/ Ethernet
Filesystem & Bootloader	(a) Flash & Storage APIs (b) File Systems (c) MCUboot & Secure Boot (d) Firmware Updates (OTA) Lab Exercise-15: Fail-Safe OTA updates Lab Exercise-16: Final Project - Real-Time IoT Application

MEET YOUR INSTRUCTOR

BENNY COHEN

Embedded Academy Founder and CEO

As a technology industry veteran, Benny Cohen combines passion for technology with extensive field experience. With a B.Sc. in Electronics Engineering and M.Sc. in Communication Engineering, he has 20+ years developing software and hardware systems. Beyond his role as founder & CEO, Benny is a hands-on practitioner specializing in penetration testing for leading global enterprises. His approachable teaching style and real-world expertise make learning engaging and relevant.

What Do The Course Graduates Say?

Ido
Real Time Embedded Course Graduate

The real-time embedded program got deep into relevant industry challenges, and I got to apply new strategies I learned to streamline our development processes.

Avishai
Real Time Embedded Course Graduate

The Embedded systems course was very detailed and relevant as I got to work on actual client projects that show industry challenges. I now work as an embedded engineer and the skills I gained are directly applicable to my daily work.

Tomer
Real Time Embedded Course Graduate

I came into the real-time embedded course with limited coding experience, but the structured learning path and personalized mentorship made the transition seamless.

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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