

# RTOS ( $\mu$ C/OS II) programming

## Synopsis & Objective of Course

An RTOS is a class of operating systems intended for real time-applications (an application that guarantees both correctness of result and the added constraint of meeting a deadline). RTOS forms the back bone of higher end embedded devices.  $\mu$ C/OS-II, the Real-Time Kernel is a highly portable, ROMable, scalable, preemptive real-time, multitasking kernel (RTOS) for microprocessors and microcontrollers.  $\mu$ C/OS-II can manage up to 63 application tasks and provides services like Task management, Semaphores, Mutex, Message Queues & Mailboxes,

## Target Audience

Programmers and engineers who wish to gain a sound understanding of embedded designing on a RTOS platform, specifically  $\mu$ C/OS-II

## Prerequisites

Attendees should have a basic knowledge of OS & programming.

An elementary knowledge of the C programming language is essential.

## Delivery

The initial concepts of RTOS will be theoretically explained by the Trainer with real life analogies. Then the trainer will implement & demonstrate the versatile features of  $\mu$ C/OS followed by hands-on exercises.

Certain development projects will be given as assignments (under complete guidance) to master a trainee in implementation oriented designing.

**Duration** : 5 days

## Course Contents

Day	Topic	Sub topics
Day 1	<b>Introduction</b>	Real Time Systems Multi tasking & Concurrency Build & Load of an application Interrupts
	<b>Software Architectures</b>	Round – Robin Round – Robin with Interrupts Function – Queue – Scheduling Architecture Real – Time Operating System Architecture Selecting an Architecture
	<b>RTOS services</b>	Tasks and Tasks States Tasks and Data Semaphores and Shared Data Message Queues, Mailboxes, and Pipes Timer Functions & Events Memory Management Interrupt Routines in an RTOS Environment

<b>Day 2</b>	<b>μC/OS-II Kernel Structure</b>	Internal structure. Tasks, Task states, Task control blocks, Task scheduling, the idle task, μC/OS-II handles interrupts, Initialize and start μC/OS-II and more
	<b>Task Management</b>	Creation μC/OS-II's task, Delete a task, Check the size of a task's stack, Change a task's priority, Suspend and resume a task, Get information about a task.  <i><b>Exercises based on tasks using DJGPP</b></i>
<b>Day 3</b>	<b>Time Management</b>	Task suspend based on timer. Task resumption based on timer. Setting and getting 32-bit clock timer  <i><b>Exercises based on Timers using DJGPP</b></i>
	<b>Flags</b>	Creating flags, Flag pending, Flag posting, Flag deleting.
	<b>Intertask Communication and Synchronization</b>	study of how μC/OS-II's services to have tasks and ISRs (Interrupt Service Routines) communicate with one another and share resources
<b>Day 4</b>	<b>Intertask Communication and Synchronization</b>	Implementation of semaphores, Implementation of message mailboxes Implementation of message queues. Implementation of Mutexes. Implementation of shared memory.  <i><b>Exercises based on Intertask communication using DJGPP</b></i>

<b>Day 5</b>	<b>Memory Management</b>	Study of dynamic memory allocation feature using fixed-sized memory blocks.
	<b>Porting <math>\mu</math>C/OS -II</b>	Introduction in general terms what needs to be done to adapt $\mu$ C/OS-II to different processor architectures
	<b>Configuration</b>	In depth study of the #define constants used to configure $\mu$ C/OS-II for your application. Configuring $\mu$ C/OS-II allows you to use only the services required by your application. This gives you the flexibility to reduce $\mu$ C/OS-II's memory footprint (code and data space).

### **Trainers' Profile**

Corporate Trainer(s) with more than 6 years of experience in embedded development & corporate training in CMM level5 companies.

### **Scheduled & On-site Training**

Apart from in-house training programs, comprehensive training can be also provided as per the requirement & will be optimally customized as per the client's needs.

*For training calendar, availability of seats & other details please mail us at [training@sigmasolutions.co.in](mailto:training@sigmasolutions.co.in)*