

ECSE426 - Microprocessor Systems

Winter 2018

Lab 4: Multithreaded, interrupt-driven readings and peripheral control.

This lab is aimed at designing a multithreaded system that uses CMSIS-RTOS (RTX based) for initiating and maintaining multiple threads of computation and handling the exception types concurrently. You will be using the same project as LAB3. The core of the previous lab remains the same though the sleep mode needs more attention.

(1) Lab 4 – RTOS Threads

Threads should be designed using CMSIS-RTOS primitives such as threads, timers, ISRs and any required OS services (mutexes, semaphores and queues ... etc).

Requirements checklist

To summarize, the tasks you need to do are to maintain the requirements from LAB-3 and add followings:

1. All above functions are to be implemented using CMSIS-RTOS.
2. You have to **present a graph in demo time** and later in Report-2 which shows how your application is divided into threads, functions, ISRs ... etc. And in case of shared resources, explain how you managed access to such resources.
3. Your efforts in reducing the power in sleep mode (as much as you can) is important to show in **demo time** and Report-2. **Providing reasons for each effort is required.**

(2) Debugging in real time

Since you will be using CMSIS-RTOS and the underlying OS (RTX), you have to be capable of debugging your code and understanding how to simplify it in face of a sizeable body of OS code. Furthermore, most processing power will be directed towards periodic tasks - interrupt- and exception-driven.

(3) Demonstration and early demo

You will need to demonstrate that your program is correct, and explain in detail how you guarantee the specified operation, and how you tested your solution. You will be expected to demonstrate a functional program and its operational performance in all situations. The final demonstration will be on **Friday, March 16th**. **Note there are no early demo bonuses** for this lab.

(4) Lab Report

The report of this lab must include structured explanation of the work done in the lab3 and lab4. The report should contain the explanation and validation of all major design decisions (e.g., task division into threads) throughout the lab. Focus on RTOS system threads design. And also include all material related to timer (PWM), filtering and controller algorithm within the context of Lab 3. That is, report 2 should cover the material of Lab 3 and Lab 4.

The **report and project files** are to be submitted by **Monday, Nov. 20th** before midnight, in the separated folders. Reports in pdf and project files in zip formats.