

## Lab 2 report ECE445M

Name: Replace with your name(s)

EID: Replace with your EID(s)

Semester: Spring 2026

Course: ECE445M

### A) *Objectives:*

- Develop OS facilities for real-time applications,
- Coordinate multiple foreground and background threads,
- Design a round robin multi-thread scheduler,
- Implement spinlock semaphores and use them for thread synchronization,
- Implement inter-thread communication using a FIFO and a mailbox.

### B) *Hardware Design:*

- MSPM0G3507 Launchpad and ECE445M sensor board.

### C) *Software Design Deliverables:*

Upload entire contents of these three folders to github

**inc**

**RTOS\_Lab2\_RTOSkernel**

**RTOS\_Labs\_common**

### D) *Measurement Data:*

1) plots of the logic analyzer like Figures 2.1, 2.2, 2.3, 2.4, and 2.6

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2) measurement of the thread-switch time, like Figure 2.4

<add here>

3) plot of the logic analyzer profile running realmain system

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4) the three sketches (one sketch from first preparation parts 1.2 and and two sketches from 1.3), with measured data collected during testing

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5) a table showing performance measurements with and without debugging instruments

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### E) *Analysis and Discussion Questions:*

1) List the origins of the time jitter in your OS

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2) Justify why Task 3 has no time jitter created by your OS.

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3) There are five (or more) interrupts in this system TimerG7, UART0, UART2, GROUP1, PendSV (thread switch), and SysTick (scheduler). Justify your choice of hardware priorities in the NVIC?

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4) Explain what happens if your stack size is too small. How could you detect stack overflow? How could you prevent stack overflow from crashing the OS?

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5) Both **Consumer** and **Display** have an **OS\_Kill()** at the end. Do these **OS\_Kills** always execute, sometime execute, or never execute? Explain.

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6) The interaction between the producer and consumer is *deterministic*. What does deterministic mean? Assume for this question that if the **OS\_Fifo** has 5 elements data is lost, but if it has 6 elements no data is lost. What does this tell you about the timing of the consumer plus display?

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7) Without going back and actually measuring it, do you think the **Consumer** ever waits when it calls **OS\_MailBox\_Send**? Explain.

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