# Week 3: Designing A Real Time System

# Task: Design a healthcare system using RTOS with the following requirements:

# ▪A touch LCD as input that can control the system and give commands. Every LCD command is represented in 4 bytes. LCD is connected to the micro-controller through UART with speed 9600 bps [Bit per second]. (Reading 4 bytes and processing the command takes 2 ms)

# ▪Blood pressure sensor with new data every 25ms. (Reading the sensor and processing its data takes 3 ms)

# ▪Heartbeat detector with new data every 100ms. (Reading the sensor and processing its data takes 1.5 ms)

# ▪Temperature sensor with new data every 10ms. (Reading the sensor and processing its data takes 2.5 ms)

# ▪Alert siren. (Activate or deactivate the siren takes 1 ms)

Diagram

Description automatically generated

***system parameters***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Task Name | Priority | Periodicity | Deadline | Execution Time |
| LCD\_Task | 0 | 100 | 100 | 2 |
| Blood\_Sensor\_Task | 2 | 25 | 25 | 3 |
| Temperature\_Sensor\_Task | 3 | 10 | 10 | 2.5 |
| Heart\_Detector\_Task | 1 | 100 | 100 | 1.5 |
| Alert\_Task | 4 | 5 | 5 | 1 |
| UART\_Task | 5 | 5 | 5 | 1 |

Tick Time Rate = 5 ms

Hyper period (LCM of all tasks) = 100 ms

CPU Load = (E1+E2+E3+E4+E4+E5+E6) / Hyper period

= ( (2\*1) + (3\*4) + (2.5\*10) + (1.5\*1) + (1\*20) + (1\*20) ) / 100 = 0.805

***Simulating in Simso***

A picture containing diagram

Description automatically generatedGraphical user interface

Description automatically generatedGraphical user interface, application, table

Description automatically generated