# Design Task

- The system to be designed is considered as safety critical system as it is a health monitoring system, that's why we need to sample the data faster than the HW capabilities , to avoid loss of data and make system as responsive as possible.

- I have designed 3 different designs, the first one consists of 5 Tasks with overall CPU load= 78%,the second one consists of 4 Tasks with same CPU load, the last one consist of 3 tasks with higher CPU load=90% .

- What is best about design 1 is that every task is independent over other tasks as every sensor is in an individual task, but for the last design, the tasks are abstracted where I grouped all sensors in one task .

# Design 1

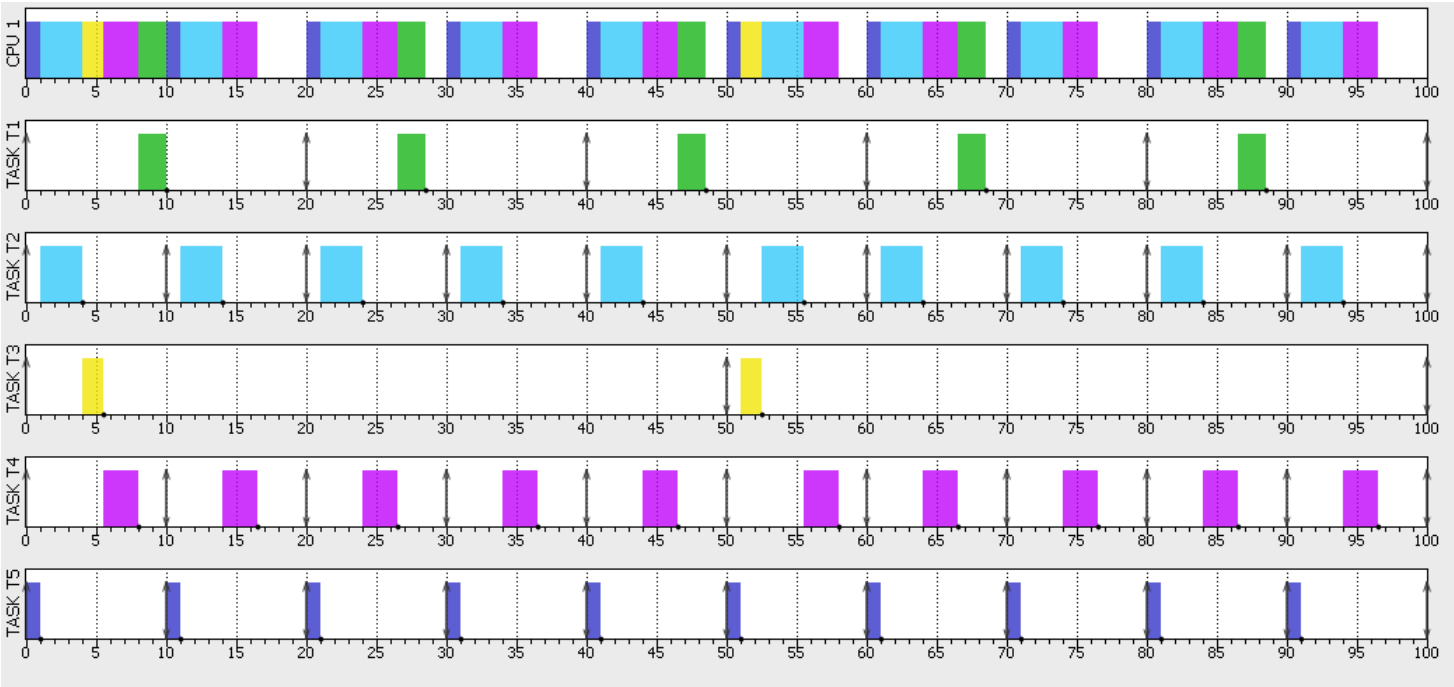| Name | Task type | Abort on miss | Act. Date (ms) | Period (ms) | List of Act. dates (ms) | Deadline (ms) | WCET (ms) | Followed by | priority |
|------|-----------|---------------|----------------|-------------|-------------------------|---------------|-----------|-------------|----------|
| TFT_UART | Periodic ▾ | ☐ No | 0 | 20.0 | - | 20.0 | 2.0 | ▾ | 1 |
| Blood Pressure Sensor | Periodic ▾ | ☐ No | 0 | 10.0 | - | 10.0 | 3.0 | ▾ | 2 |
| Heart beat sensor | Periodic ▾ | ☐ No | 0 | 50.0 | - | 50.0 | 1.5 | ▾ | 2 |
| Temp sensor | Periodic ▾ | ☐ No | 0 | 10.0 | - | 10.0 | 2.5 | ▾ | 2 |
| SIREN | Periodic ▾ | ☐ No | 0 | 10.0 | - | 10.0 | 1.0 | ▾ | 3 |

Tick rate = 10 MS

Hyper Period = 100 MS

CPU Load = 78%

Verification using SIMSO

Gantt Chart

# Design 3

| Name | Task type | Abort on miss | Act. Date (ms) | Period (ms) | List of Act. dates (ms) | Deadline (ms) | WCET (ms) | Followed by | priority |
|------|-----------|---------------|----------------|-------------|-------------------------|---------------|-----------|-------------|----------|
| TFT_UART | Periodic | ☐ No | 0 | 20 | - | 20 | 2 | ▼ | 1 |
| SENSORS | Periodic | ☐ No | 0 | 10 | - | 10 | 7 | ▼ | 2 |
| SIREN | Periodic | ☐ No | 0 | 10 | - | 10 | 1 | ▼ | 3 |

Tick rate = 10 MS

Hyper period =20 MS

CPU Load =90%

Verification Using SIMSO

Gantt Chart

| T3 | T2 | | T1 | T3 | T2 | | IDLE |

0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20
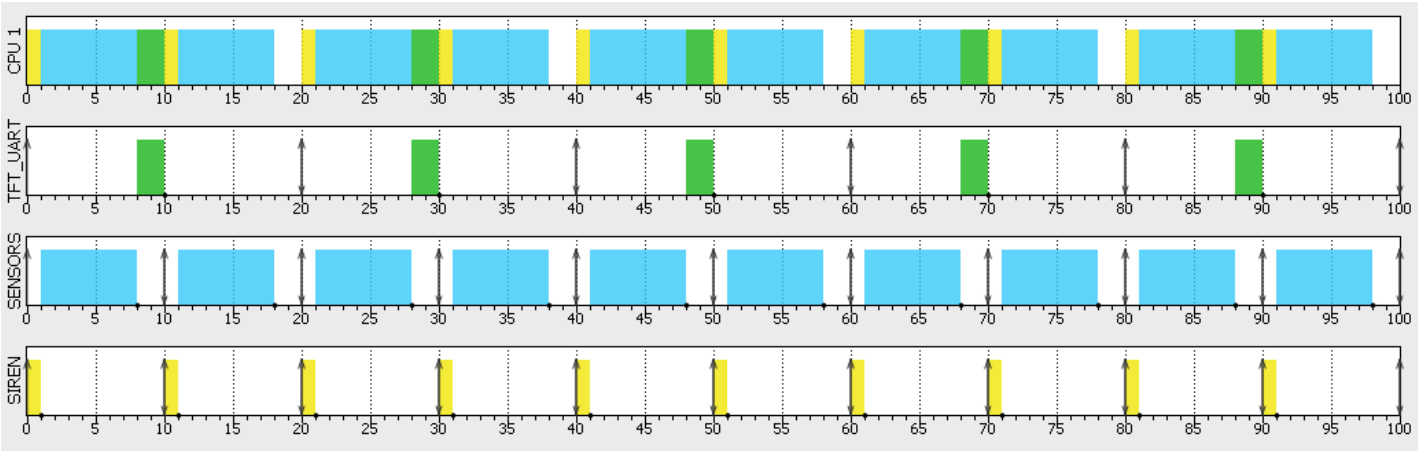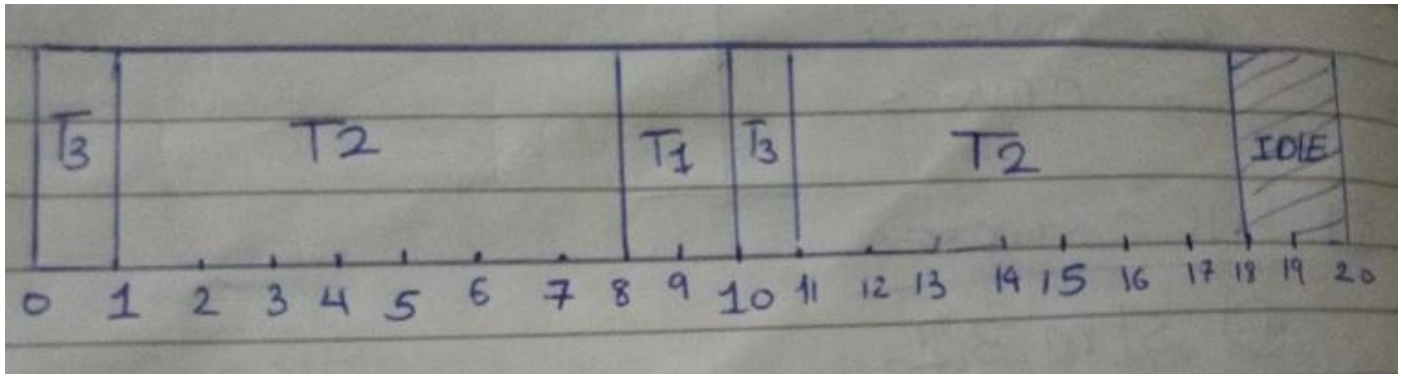
I have chosen the periodicity of

- TFT_UART : with analogy to button debouncing .
- SENSORS : tried to apply Nyquist Rule fs >= $2f_{max}$ .
- SIREN : to be fast enough with the data read and alert the system .