# Real-Time / Embedded Systems Assignment

The team assignment for the lecture IN2060 consists of the design and planning of a Real-Time / Embedded System. Students will work in groups (6-10 people). They will choose one of the suggested topics and during the second part of each lecture the teams will work on the design and modelling of the system. The system does **NOT** have to reach a real implementation, but should include the aspects described in this document, which are covered during the theoretical part of the course.

The groups will prepare a poster (A1) showing the main aspects of their system in a graphical manner (Modelling, System Overview, Software and Hardware architecture, simulation) and a document of not more than 4 pages containing the name of the system, team members and the description of the system.

The teams that fulfill these requirements will receive bonus points in their final exam (0.3) ONLY if the exam grade is already above or equal to 4.0 (pass)

## -Description of system

What are the system and functional requirements?

**Functional requirements:**

-What is the system intended to do?

**System requirements:**

-Hardware/OS/middleware software required to create the system

**-Real-Time Requirements:**

Is the system to be designed hard or soft real-time? Give a reason for it.

-Does it require to have a real-time clock? How precise should the clock of the system be?

## -High level model

Design a UML diagram of the different components of the system.

Use one of the mentioned tools from the modelling class to develop a simulation of one part or complete system (Modelling tools: Matlab/Simulink, Ptolemy, JSim, Labview, AutoMedic)

## -Operating System

From the operating systems described in the lecture, which one would you choose to use in your system? Other non real-time OS are possible, justify and mention what would be the drawbacks of this.

## -Hardware and communication

On which hardware platform would you use your system, what are the costs? What kind of processor? What is the memory required? What are the inputs and output ports in the system?

What are the communication requirements? What kind of communication protocols would you use?

## -Scheduling example

Describe the tasks that the microprocessor should execute, what are the priorities of those tasks?

Show a fragment of the

## -Pseudo code of one part of the system

## You will create a poster (A1) which shows the different components of the system

## Suggested topics to develop:

-Alarm system for elderly people (Fall detection, Heart attack) (Mendoza)

-Medication machine for patients in ICU (Mendoza)

-Smart traffic control (Mendoza)

-Autonomous car (Mendoza)

-Smart home ( sound system, temperature, light) (Mendoza)

-Surgical robot (Mendoza)

- Human-robot-collaboration for cooking, assembly tasks etc.

- Control of an autonomous quadrocopter (e.g. for surveillance tasks)

- Welding robot in a car manufacturing plant

- Control of a rail station

- Video conference system

- Washing machine

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Poster example, can be arranged differently.

Suggested tools to create poster: Inkscape and Gimp for image editing.