Hard and Soft 2012 Task Description

OLLA: OnLineLab

An online lab built around the mBed module supplied activated and supported through a Moodle learning environment.

Two sets of experiments, the first compulsory is a sweep through instrumentation and control starting from a thermistor thermometer building up to a demonstrator for PID control of an oven, more details are given below.

The second experiment set is your free choice and should be linked to some other common subject area studied at university from computer science/engineering, electronic/electrical engineering or applied physics.

The Jury will expect to see that:

1. The experimental set-up is controlled by the mBed and require little or no human intervention to operate
2. The user interface is through a Moodle system, each team has its own course site. The Jury do not expect you to write full experiment text, outlines/notes are OK so long as your intent is clear.
3. Wireless and/or mobile data and control is used somewhere in your design
4. Your design, both hardware and software, will be inexpensive, easy to set-up and maintain and easily expanded with more experiment
5. You may use only equipment and components supplied or approved by the contest organisers. (You are allowed to use your own laptops and smart devices.)
6. All features of your design must make a direct contribution to the experimental set-up, the learning, or be associated with the management, maintenance, or expansion of the system.

Compulsory Experiment set: OLLIC: online lab in Instrumentation & Control

A basic knowledge of instrumentation and control is part of most computer, electrical, physics university courses. The suggested experiment set is based on Prof Hall's course for third year Applied Physics students, where the instrumentation aspects are more important than the control theory aspects – some illustrative lab scripts and assignment briefings are supplied to help you establish

the level and depth expected. The level you should aim for is third year just before specialisation.

Suggested experiment flow:

Thermistor, Simple Thermistor Thermometer

d.c. Wheatstone Bridge, Difference Thermometer

(Basic Op Amp functions)

Common Mode and Noise, differential amplifier

Four Op Amp Instrumentation Amp

Temperature measurement and display. Conversion Centigrade, Fahrenheit, Absolute (Kelvin)

Simple Oven

Set Point on/off control

Dynamic control – Improving on on/off. Develop and illustrate PID

You are free to change or add to this suggested experiment flow, but you must present a coherent experiment set.

Note: Try to make your oven have a small thermal mass this will reduce latency and enable more rapid temperature change.

Your Experiment(s): OLLFREE

Choose a topic that is a common part of a university programme in computers, electrical, or physics at either third year level before specialisation, or a core advanced topic from fourth or fifth year.

You must observe the six key features, stated above, that the Jury expect to see in your design.

Judging

The Jury will visit each team at least twice, on Wednesday and on Friday morning. The first visit is to gain familiarity with what you are doing and to get a progress report. On Friday the Jury will expect to see a demonstration of your completed work. On Friday afternoon you will be expected to demonstrate your work to a wider audience.

The Jury require you to submit two written reports (through the Moodle). The first a design briefing and progress report by 10:00 am on Wednesday. The second a final report by 9:00 am on Friday. (These reports are an aid to the judging process, there is no need to spend too much time in editing, a note format is OK.)

The Jury will give their adjudication at the Award Ceremony on Friday afternoon.