Cyber-Physical Industrial Systems

MODULE 1 SESSION 1

IDENTIFY THE PHYSICAL QUANTITIES TO BE MEASURED OR THE DATASETS TO BE ACQUIRED AND COMPUTED

LECTURER NOTES

Advise the students to perform the following steps:

- Draft a sketch or a diagram of the system to be studied;
- On the diagram, underline the interactions of the system with its environment and the interactions between system's components;
- Name the physical quantities involved in each interaction, even if they are not independent (these can be either mechanical, electrical, magnetic, thermal or radiation based, which led to some specific physical quantities: force, acceleration, speed, displacement (linear or angular), pressure, torque, voltage, current, electric power, magnetic field, electric pulse, temperature, light intensity etc);
- On the system's diagram, write down the names of the physical quantities, close to the interactions areas;
- Leave the problem open, noting that for each physical quantity there will be a transducer or a sensor to be chosen;
- Identify also other non-physical quantities which would be of interest to be determined, e.g. number of parts, needed time for an activity etc;
- Write down the names of these quantities on the system's diagram.

Ask each team to present its system diagram and explain which are the physical quantities to be measured or the data sets to be acquired.

Ask them to specify the type of each quantity (mechanical, electrical etc).

Be carefull that the lab will have to provide the students with the necessary components and also the students will have to perform measurements in a setup which will have to be as similar as possible to the real situation.

Be careful not to let the students to engage in designing systems which cannot be built in the lab because of lack of components.

Explain why some quantities cannot be measured in the lab and ask the students to change their choice accordingly.

Finally, each team would have to deliver a document containing the system's diagram and the list of quantities to be measured and data sets to be acquired.

MEASURED QUANTITIES EXAMPLES

- Machine tool's vibrations measurement system: rotational speed, motor temperature, vibrations' acceleration
- Self-sufficient plant watering system: air temperature, air humidity, soil humidity, light intensity, time of day, water tank level, water temperature
- Fuel station safety system: air temperature, gas concentration, wind speed
- Avionics air pressure measurement system: compressed air pressure, air flow, surface air (static) pressure