POLITEHNICA University of Bucharest (**UPB**)
Faculty of Industrial Engineering and Robotics (**IIR**)
Study Programme: Industrial Engineering (**IE**)
Form of study: Licence (Bachelor)

COURSE SPECIFICATION

Course title:	Instrumentation and Measurement	*Semester:*	5
Course code:	UPB.06.S.05.O.002	*Credits (ECTS):*	4

Course structure	Lecture	Seminar	Laboratory	Project	Total hours
Number of hours per week	2		2		4
Number of hours per semester	28		28		56

Lecturer	Lecture	Laboratory
Name, academic degree	Prof. Tom SAVU	Prof. Tom SAVU
Contact (email, location)	savu@ctanm.pub.ro Room CE 111, CB 204	savu@ctanm.pub.ro Room CE 111, CB 204

Course description:

The **main course topics** are:The general structure of the computerized data acquisition systems; Sensors and transducers; Signal conditioning for different types of transducers; Data acquisition boards: main types, analog input and output functions, digital input and output functions, counter / timer functions, characteristics; General programming for data acquisition; Data acquisition programming using graphical programming environments; Specific aspects for measuring different mechanical and electrical values: force, displacement, speed, acceleration, temperature, pressure, torque, strain, rotational values, electrical power, light intensity, sound intensity; Data processing and analysis techniques; Controlling stepper and DC motors; Image acquisition and processing; Data communication protocols: serial, TCP/IP, wireless etc.
Teaching methods include: Lecturing accompanied by visual aids such as PowerPoint presentations or web pages; Demonstrating through examples and simple experiments; Collaboration during discussions.
Teaching materials include:Computer with presentation software, data acquisition software and Internet connection; Video projector and projection screen; Experimental setups, sensors, transducers, data acquisition systems.

Laboratory description:

Laboratory works include: Identifying the measured and the controlled variables. GUI design; Choosing the sensors and the transducers; Designing the analog part of a data acquisition system; Choosing, configuring and testing the data acquisition boards; Voltage and current measurements; Signal generation; Temperature measurement and control; Force and displacement measurement; Measuring light intensity; Events counting; Image acquisition and processing; Serial and TCP/IP communications.

Teaching and learning methods are based on: Problem based learning; Explaining; Collaborating.
Materials include:Computers with data acquisition software and Internet connection; E-Learning platform; Experimental setups, sensors, transducers, data acquisition systems.

Intended learning outcomes:

Gaining knowledge about: the main characteristics of the data acquisition systems, application areas, components selection rules, programming methodology, specific aspects related to different physical parameters, data storage, reporting and communications.
Gaining knowledge and experience, through problem solving using experiments, about several steps from the process of designing, developing and using a data acquisition system.

Assessment method:	% of the final grade	Minimal requirements for award of credits
Written exam	40	Students will have to make a short oral presentation about a randomly chosen subject. Additional questions will be asked by the examiner, especially regarding the topics for which the student obtained less points during the laboratory works.

Laboratory	60	For each of the L2 ... L13 laboratory work, each student will receive between 0 and 3 points, according to the amount which is acquired from the work's objectives. The laboratory works not performed or those for which 0 points were received will have to be rescheduled. The total number of points will be multiplied for obtaining the 60% of the final grade. For having the laboratory activities completed, a student must obtain at least 1 point in each work and must obtain at least 30% of the final grade.

References:
http://www.globalspec.com/ http://www.electronics-tutorials.ws/io/io_1.html http://www.ni.com/white-paper/3536/en http://www.ni.com/white-paper/3116/en http://colos.inf.um.es/rlab/varios/CDQTUTO.pdf http://www.ni.com/white-paper/7466/en http://www.hbm.com/en/menu/tips-tricks/ http://www.ni.com/white-paper/3638/en http://www.capacitance-sensors.com/capacitive_sensor_tutorial.htm http://www.thermix.net/2012/09/types-of-speed-measuring-device-basic.html http://zone.ni.com/devzone/cda/ph/p/id/12 http://www.ni.com/white-paper/7110/en

Prerequisites:	Co-requisites *(courses to be taken in parallel as a condition for enrolment)*:

Mathematics 1 Computer programming 1 Mathematics 2 Computer programming 2	

The course is practical oriented, including real time experimental demonstrations and real life examples.
Laboratory works are performed by teams of 2 – 4 students. During almost every laboratory work, the team has to build its own experimental setup and to finalise a written report including experimental data and results analysis.
Students are encouraged to develop also their own projects, especially for assisting their experimental research activities or for assisting homework or projects related to other courses.

Date: 08.07.2016
Professional degree, Surname, Name: Prof. Tom SAVU