

# Syllabus

## 1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Automation and Computer Science
1.3 Department	Automation
1.4 Field of study	Systems Engineering
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Automation and Applied Informatics (English)
1.7 Form of education	Full time
1.8 Code of discipline	51.10

## 2. Data about the subject

2.1 Subject name	<b>Microsystems and Data Acquisition</b>				
2.2 Course responsible/lecturer	Assoc. Prof. Eng. Moiş George, PhD – george.mois@aut.utcluj.ro				
2.3 Teachers in charge of applications	Assoc. Prof. Eng. Moiş George, PhD – george.mois@aut.utcluj.ro				
2.4 Year of study	4	2.5 Semester	1	2.6 Assessment (E/C/V)	E
2.7 Type of subject	DF – fundamental, DID – in the field, DS – specialty, DC – complementary				DS
	DOB – compulsory, DO – elective, FAC – optional				DO

## 3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminar	0	Laboratory	2	Project	0
3.2 Number of hours per semester	56	of which:	course	28	Seminar	0	Laboratory	28	Project	0
3.3 Individual study										
(a) Manual, lecture material and notes, bibliography										14
(b) Supplementary study in the library, online and in the field										12
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										12
(d) Tutoring										3
(e) Exams and tests										3
(f) Other activities:										0
3.4 Total hours of individual study (sum of (3.3(a))...(3.3(f)))					44					
3.5 Total hours per semester (3.2+3.4)					100					
3.6 Number of credit points					4					

## 4. Pre-requisites (where appropriate)

4.1 Curriculum	-
4.2 Competence	Analog and digital data acquisition system architectures, signal conditioning circuitry, signal generators, sensors and transducers, microcontrollers and industrial equipment programming

## 5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	Attendance is mandatory

## 6. Specific competences

6.1 Professional competences	<p>C5 Application development and implementation of control structures and algorithms, using project management principles, programming environments and microcontroller-based technologies, signal processors, programmable automation systems, embedded systems</p> <p>C5.1 Identification of the concepts and methods for project management and of specific languages for application development (sequential, concurrent, real-time, non-real-time, distributed, embedded, non-embedded, mobile, on-line, etc.).</p> <p>C5.4 Assessment of the implementation of automation and IT applications using automatic control structures, algorithms, programming</p>
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	environments and technologies based on microcontrollers, signal processors, programmable logic controllers, embedded systems, etc.
6.2 Cross competences	-

## 7. Course objectives

7.1 General objective	Understand the concept of virtual instrumentation, of analog and digital data acquisition systems
7.2 Specific objectives	<ul style="list-style-type: none"> <li>- Knowledge of LabVIEW™ specific programming techniques,</li> <li>- Implementing programs using graphical programming,</li> <li>- Accomplishment of analog and digital signal acquisition,</li> <li>- Implementing control structures using LabVIEW™, with industrial equipment or instruments.</li> </ul>

## 8. Contents

8.1 Lecture	No.hours	Teaching methods	Notes
Introduction to the LabVIEW™ Environment	2	Projector presentations, or Microsoft Teams platform discussions	-
Data Acquisition. USB6009 User Guide And Specifications	2		
Implementing a program in LabVIEW™ (Virtual Instruments - VIs)	2		
Data Types: Vectors, Clusters, etc. Troubleshooting and Debugging VIs	2		
Developing Modular Applications. Storing Measurement Data in Files	2		
Communicating Between Multiple Loops running in parallel on a computing system	2		
Programming techniques introduction for myRIO embedded system. Short presentation of the real-time system and programming using LabVIEW™ FPGA	2		
Industrial Instrument Control from LabVIEW™	2		
Controlling the User Interface	2		
Improving an Existing VI	2		
Wireless Sensor Network. Statechart. MathScript. Industrial applications of the technologies presented.	2		
Programming ARM microcontrollers from LabVIEW™. Control and simulation. Simulink Interface	2		
Process Identification. Programming of Android Mobile Devices. Programming of Industrial Touch Panels	2		
Programming Arduino Devices from LabVIEW™. Hardware-in-the-Loop Simulation. New Technologies "Vector Signal Transceiver"	2		
Bibliography			
1. Robert H. Bishop, National National Instruments, “LabVIEW 2009 Student Edition”, Prentice Hall, 2009, Bibl. UTC-N 536.027.			
2. John Essick, “Hands-On Introduction to LabVIEW for Scientists and Engineers”, Oxford University Press, 2008, Bibl. UTC-N 536.028.			
3. Peter A. Blume, „The LabVIEW Style Book”, Prentice Hall, 2007, Bibl. UTC-N 541.283.			
4. Ronald Larsen, „LabVIEW for Engineers", Prentice Hall, 2010, Bibl. UTC-N 541.295.			
5. Stephen Philip Tubbs, “LabVIEW for Electrical Engineers and Technologists”, Stephen Philip Tubbs, 2011, Bibl. UTC-N 535.886.			
6. National Instruments, „LabVIEW Core 1 Course Manual”, Course Software Version 2010, August 2010 Edition, Part Number 325290B-01, digital format.			
7. National Instruments, „LabVIEW Core 2 Course Manual”, Course Software Version 2010, August 2010 Edition, Part Number 325292B-01, digital format.			
8.2 Applications (seminar/laboratory/project)	No.hours	Teaching methods	Notes
LabVIEW™ Introduction. Express VIs using and USB-6009 Data Acquisition System with Sensors Extensions	4	Practical activities on the equipment, or simulation, the development of	-
Data Acquisition and Processing in LabVIEW™. NI DAQmx Drivers for USB-6009 DAQ	4		

SubVIs Implementation. Signal Generators Implemented with LabVIEW™. Storing Measurement Data. Serial Data Transmission	4	software applications, supplementary explanations using presentations related to applications, or Microsoft Teams platform discussions	
Identified a Process and Design a Control System in LabVIEW™	4		
myRIO Programming with LabVIEW™ Real Time, simple applications for sensor and actuators	4		
myRIO complex application with LabVIEW™ Real Time and FPGA	4		
Practical exam	4		
Bibliography			
1. Silviu Folea, „Microsystems and Data Acquisition. Applications”, Cluj-Napoca, 2023, digital format.			
2. Silviu Folea (Editor), “Practical Applications and Solutions using LabVIEW™ Software”, InTech, Croatia, 2011, online: <a href="http://www.intechopen.com/books/practical-applications-and-solutions-using-labview-software">http://www.intechopen.com/books/practical-applications-and-solutions-using-labview-software</a> .			

**9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field**

The topics presented at this course are specialized ones; they are included in other universities' curricula. The LabVIEW™ graphical programming environment is used in industrial testing, measurement and control applications.

**10. Evaluation**

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Acquired knowledge	Written exam and oral evaluation using Microsoft Teams platform	50%
Seminar	-	-	-
Laboratory	Acquired practical skills	Evaluation of the laboratory reports and Practical exam and oral evaluation using Microsoft Teams platform	50%
Project	-	-	-
Minimum standard of performance:			

Date of filling in:		Title Firstname NAME	Signature
15.03.2023	Course	Assoc. Prof. Eng. George MOIȘ, PhD	
	Applications	Assoc. Prof. Eng. George MOIȘ, PhD	

Date of approval by the Automation Department Board ___. ___.2023	Head of Automation Department Prof. Eng. Honoriu VĂLEAN, PhD
Date of approval by the Faculty of Automation and Computer Science ___. ___.2023	Dean Prof. Eng. Liviu MICLEA, PhD