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	***Microsystems and Data Acquisition***				
2.2 Course responsible/lecturer	Assoc. Prof. Eng. Rusu-Both Roxana, PhD – roxana.both@aut.utcluj.ro				
2.3 Teachers in charge of applications	Eng. Toderean Bianca, PhD(c) - bianca.toderean@gmail.com				
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	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 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.). C5.4 Assessment of the implementation of automation and IT applications using automatic control structures, algorithms, programming

	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	- Knowledge of LabVIEW™ specific programming techniques, - Implementing programs using graphical programming, - Accomplishment of analog and digital signal acquisition, - Implementing control structures using LabVIEW™, with industrial equipment or instruments.

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, 2019, digital format.
2. Silviu Folea (Editor), "Practical Applications and Solutions using LabVIEW™ Software", InTech, Croatia, 2011, online: http://www.intechopen.com/books/practical-applications-and-solutions-using-labview-software.

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**
01.07.2022	Course	Assoc. Prof. Eng. Roxana RUSU-BOTH, PhD	
	Applications	Eng. Bianca TODEREAN, PhD(c)	

Date of approval by the Automation Department Board __.__.2022	Head of Automation Department Prof. Eng. Honoriu VĂLEAN, PhD
Date of approval by the Faculty of Automation and Computer Science __.__.2022	Dean Prof. Eng. Liviu MICLEA, PhD