SYLLABUS[1]

1. Information about the program

1.1 Higher education institution	University Politehnica Timisoara
1.2 Faculty[2] / Department[3]	Faculty of Electronics and Telecommunications/Measurements and Optical Electronics Department
1.3 Chair	—
1.4 Field of study (name/code[4])	Electronics Engineering and Telecommunications/10
1.5 Study cycle	License
1.6 Study program (name/code)/Qualification	Technologies and Telecommunications Systems/20.20.20.100.10/ Technologies and Telecommunications Systems

2. Information about the discipline

2.1 Name of discipline			Virtual Instrumentation				
2.2 Coordinator (holder) of course activities			Professor Mihaela Ruxandra LASCU				
2.3 Coordinator (holder) of applied activities [5]			Professor Mihaela Ruxandra LASCU				
2.4 Year of study[6]	III	**2.5** Semester	5	**2.6** Type of evaluation	Exam	**2.7** Type of discipline	Mandatory

3. Total estimated time (hours / semester of didactic activities)

3.1 No. of hrs. / week	2 , of which:	**3.2** course	2	**3.3** seminar/laboratory/ project/training	0/1/1/0
3.4 Total no. of hrs. in the education curricula	56 , of which:	**3.5** course	28	**3.6** applied activities	28
3.7 Distribution of time for individual activities related to the discipline					hrs.
Study using a manual, course materials, bibliography and lecture notes					10
Additional documentation in the library, on specialized electronic platforms and on the field					10
Preparation for seminars / laboratories, homeworks, assignments, portfolios, and essays					5
Tutoring					5
Examinations					5
Other activities					0
Total hrs. of individual activities					35

3.8 Total hrs. / semester[7]	91
3.9 No. of credits	4

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1 The form corresponds to the Syllabus promoted by OMECTS 5703/18.12.2011 (Annex3).
2 The name of the faculty which manages the educational curriculum to which the discipline belongs.
3 The name of the department entrusted with the discipline, and to which the course coordinator / holder belongs.
4 Fill in the code provided in GD no. 493/17.07.2013.
5 The applied activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
6 The year of study to which the discipline is provided in the curriculum.
7 It is obtained by summing up the number of hrs. from 3.4 and 3.7.

4. Prerequisites (where applicable)

4.1 Curriculum	• C, C++ Programming, Analog Micro Electronics, Analog Integrated Circuits, Basic Electronics.
4.2 Competencies	• Using specialized software and electronic resources written in English.

5. Conditions (where applicable)

5.1 of the course	• Classroom as required
5.2 to conduct practical activities	• Classroom as required

6. Specific competencies acquired

Professional competencies[8]	• Applying knowledge, concepts and basic methods related to circuits and electronic instrumentation, programming techniques and languages.
Transversal competencies	• Adapting to new technologies, professional and personal development, by continuous study using printed documentation resources, specialized software and electronic resources available in an international language.

7. Objectives of the discipline (based on the grid of specific competencies acquired)

7.1 General objective of the discipline	• LabVIEW represents graphical programming for data acquisition, instrument I/O, measurement analysis and visualization. LabVIEW can be used to : acquire analog waveforms using a DAQ board, store the waveforms in a file and retrieve them, collect and log temperature data, control an instrument connected to a serial port, acquire waveforms from a serial instrument, control GPIB instrument, acquire waveforms from a GPIB instrument, plot acquired data on strip charts and graphs. Save data in files that you can retrieve with a spreadsheet.
7.2 Specific objectives	• Apply structured programming concepts in developing VI programs and employ various debugging techniques; • Apply the knowledge of LabVIEW programming for simulating and analyzing the data; • Create applications that uses plug-in DAQ boards and built-in analysis functions to process the data; • Build applications that use General Purpose Interface Bus and Serial Communication Interface;

8 The professional competencies and the transversal competencies will be treated according to the Methodology of OMECTS 5703/18.12.2011. The competencies listed in the National Register of Qualifications in Higher Education [Registrul Naţional al Calificărilor din Învăţământul Superior RNCIS] (http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL) will be used for the field of study from 1.4 and the program of study from 1.6 of this form, involving the discipline.

	• Design and analyze various applications using Advanced Signal Processing toolkit; • Design and analyze various applications using Control and Simulation toolkit; • Generate the report using built in LabVIEW functions; • Acquire, analyze and present an ECG signal using Virtual Instrumentation and also implementing an algorithm to calculate its heart rate.

8. Content

8.1 Course	No. of hours	Teaching methods
1. GRAPHICAL PROGRAMMING ENVIRONMENT Introduction History of Virtual Instrumentation LabView and Virtual Instrument Conventional and Graphical Programming Future Perspective Owned and Free Labels Tools and Other Palettes Arranging Objects Pop-up menus Color Coding, Code Debugging, Context Sensitive Help Virtual Instrument Types, Creating Sub-virtual instruments.	4	Lecture and heuristic dialogue
2. FUNDAMENTALS OF VIRTUAL INSTRUMENTATION PROGRAMMING Modular programming Controlling Program execution with structures Composite data arrays and clusters Visual displays types- graphs and charts-analog and digital Shift registers and feedback nodes Local and global variables Exploring string and File input and output operations.	6	Lecture and heuristic dialogue
3. DATA ACQUISITION WITH LABVIEW Concept of Virtual Instrumentation PC based data acquisition Typical on board DAQ card Resolution and sampling frequency Multiplexing of analog inputs Single-ended and differential inputs Different strategies for sampling of multi- channel analog inputs Concept of universal DAQ card Use of timer-counter Analog outputs on the universal DAQ card-NI-DAQmx Tasks	6	Lecture and heuristic dialogue
4. CLUSTER OF INSTRUMENTS IN SYSTEM	6	Lecture and heuristic

Interfacing of external instruments to a PC RS232C, RS-422, RS485 USB standards-IEEE488 Standard-ISO-OSI model for series bus Introduction to bus protocols of MODbus and CANbus.		dialogue
5. ANALYSIS TOOLS AND SIMPLE APPLICATION IN VI Signal Processing and manipulation Anti-aliasing Filter Frequency-Domain Signal analysis (DFT and FFT) Power Spectrum Windowing Practical Hints for Frequency Domain Analysis Signal Processing Functions Time Domain Analysis, Frequency Domain Analysis Filters Control design and simulation Simulation of a simple second order system Report generation Generation of HTML page.	6	Lecture and heuristic dialogue

Bibliography[9] 1. Lascu Mihaela, Ionel Raul, Programare grafica, Editura Politehnica Timisoara, ISBN: 978-606-554-908-1, 236 pag., 2015.

2. Lascu Mihaela, Tehnici avansate de programare în LabVIEW, Editura Politehnica Timişoara, ISBN 978-973625-532-8, 310 pag., 2007.

3. Bitter, R., Mohiuddin, T., Nawrocki, M., LabVIEW: Advanced Programming Techniques, CRC Press, ISBN 0-8493-2049-6, 440 pag., 2007.

4. Cottet, F., Ciobanu, O., Bazele programării în LabVIEW, Ed. Matrix Rom, Bucureşti1998.

5.***G Programming Reference Manual. National Instruments, January 1998.

6. ***LabVIEW Function and VI Reference Manual. National Instruments, January 1998

7. Essick,J., Advanced LabVIEW Labs, Prentice Hall, 1999

8. Travis, J.,Kring, J., LabVIEW for Everyone: Graphical Programming Made Easy and Fun (3rd Edition) (National Instruments Virtual

[9] At least one title must belong to the department staff teaching the discipline, and at least 3 titles must refer to national and international works relevant for the discipline, and which can be found in the Politehnica University Library.

Instrumentation Series) (Hardcover), August 2006 ISBN-10: 0131856723 9. Stamps, D, . Learn Labview 2012 Fast, SDC Publications, 2013, ISBN1585038504, 9781585038503.

8.2 Applied activities[10]	No. of hours	Teaching methods
1. Development of basic algorithms in LabVIEW	2	Laboratory work
2. Development of Sub Vis.	2	Laboratory work
3. Generation of Fibonacci series using formula node and shift registers.	2	Laboratory work
4. Build a VI to find whether a given number is prime number or not using flat sequence structure/stacked sequence structure.	2	Laboratory work
5. Development of algorithms using Arrays and clusters functions.	2	Laboratory work
6. Amplitude Modulated wave generation and demodulate on.	2	Laboratory work
7. Data Acquisition from various sensors using DAQ Cards- Finite and continuous buffered acquisition mode.	2	Laboratory work
8. Building a VI to simulate and study the performance of First order and second order systems.	4	Project
9. Acquire, analyze and present an ECG signal using Virtual Instrumentation and also implementing an algorithm to calculate its heart rate and ECG processing.	10	Project

Bibliography[11] 1. Lascu Mihaela, Ionel Raul, Programare grafica, Editura Politehnica Timisoara, ISBN: 978-606-554-908-1, 236 pag., 2015.

2. Lascu Mihaela, Tehnici avansate de programare în LabVIEW, Editura Politehnica Timişoara, ISBN 978-973625-532-8, 310 pag., 2007.

3. Bitter, R., Mohiuddin, T., Nawrocki, M., LabVIEW: Advanced Programming Techniques, CRC Press, ISBN 0-8493-2049-6, 440 pag., 2007.

4. Cottet, F., Ciobanu, O., Bazele programării în LabVIEW, Ed. Matrix Rom, Bucureşti1998.

5.***G Programming Reference Manual. National Instruments, January 1998.

6. ***LabVIEW Function and VI Reference Manual. National Instruments, January 1998

7. Essick,J., Advanced LabVIEW Labs, Prentice Hall, 1999

8. Travis, J.,Kring, J., LabVIEW for Everyone: Graphical Programming Made Easy and Fun (3rd Edition) (National Instruments Virtual Instrumentation Series) (Hardcover), August 2006 ISBN-10: 0131856723

9. Stamps, D, . Learn Labview 2012 Fast, SDC Publications, 2013, ISBN1585038504, 9781585038503.

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

[10] The types of applied activities are those specified in footnote 5. If the discipline contains several types of applied activities, then these will be written consecutively in the lines of the table below. The type of activity will be written in a distinct line, as „Seminar:", „Laboratory:", „Project:" and/or „Practice/Training:".

[11] At least one title must belong to the staff teaching the discipline.

One of the most important function that Virtual Instrumentation discipline has is to attract third-year students from the Faculty of Electronics and Telecommunication in the graphical programming area. This condition is established as the examples used during the teaching discipline Virtual Instrumentation are sufficiently diverse, relevant for current students to create an accurate picture and useful virtual instruments on the relationship that Virtual Instrumentation has with other computational disciplines.

• The cross-discipline contents for Virtual Instrumentation follows the expectations and needs of the professional community and is tracked carefully in short cycles - one year, and long cycles - three years: on the one hand, it supervises the number of students that are engaged after one year of completing the course, and on the other hand the number of students selected within 3 years from completion of the course, those who prove skills in research or outstanding academic results.

The feedback from the students who manage investments in companies and have representative positions have an important role in updating from year to year the labor and course teaching, according to market needs.

• Virtual instrumentation (graphical programming) is also studied in universities as University of Texas, USA, New York University, USA, Dalhousie University, Canada.

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10. Evaluation

Type of activity	**10.1** Evaluation criteria	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Knowledge of discussed concepts	Written exam	66%
10.5 Applied activities	**S:**		
	L: Problem solving	Written Tests	16.5%
	P: Project implementation	Project evaluation	16.5%
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified)			
• Understanding of concepts which the course focuses on. Knowledge is verified by written exam, written tests and project work.			

Date of completion	Course coordinator (signature)	Coordinator of applied activities (signature)
22.04.2016	....	....

Head of Department (signature)	Date of approval in the Faculty Council[12]	Dean (signature)
....		....

[12] Avizarea este precedată de discutarea punctului de vedere al board-ului de care aparţine programul de studiu cu privire la fişa disciplinei.