

## SYLLABUS

### 1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Electronics, Telecommunications and Information Technology
1.3	Department	Applied Electronics
1.4	Field of study	Electronics and Telecommunications Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Telecommunications Technologies and Systems/ Engineer
1.7	Form of education	Full time
1.8	Subject code	TST-E108.00

### 2. Data about the subject

2.1	Subject name	Data Acquisition Systems
2.2	Subject area	Electronics and Telecommunications Engineering
2.3	Course responsible/lecturer	Assoc. Prof. Liviu Marin Viman, PhD eng.
2.4	Teachers in charge of applications	Assoc. Prof. Liviu Marin Viman, PhD eng. Assoc. Prof. Septimiu Pop, PhD eng. Assist.Prof. Mihai Daraban, PhD eng.
2.5	Year of study	III
2.6	Semester	2
2.7	Assessment	Verif.
2.8	Subject category	DS/ FAC

### 3. Estimated total time

Year / Sem.	Subject name	No. of weeks	Course			Applications			Indiv. study	TOTAL	Credits
			[hours/week]			[hours/sem.]					
			S	L	P	S	L	P			
III/II	Data Acquisition Systems	14	2	1	2	28	14	14	22	78	3

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the curriculum	56	3.5	of which, course	28	3.6	applications	28
Individual study								Hours
Manual, lecture material and notes, bibliography								14
Supplementary study in the library, online and in the field								-
Preparation for seminars/laboratory works, homework, reports, portfolios, essays								4
Tutoring								2
Exams and tests								2
Other activities								-
3.7	Total hours of individual study	22						
3.8	Total hours per semester	78						
3.9	Number of credit points	3						

### 4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Electronic Devices and Circuits, Data Acquisition Systems Fundamentals, Microcontrollers, Sensors and Transducers

### 5. Requirements (where appropriate)

5.1	For the course	Amphitheatre, Cluj-Napoca
5.2	For the applications	Laboratory, Cluj-Napoca

## 6. Specific competences

Professional competences	Theoretical knowledge (what the student must know):	<ul style="list-style-type: none"> <li>- The design of the structure and the components of a data acquisition system, according to the required application.</li> <li>- To deeply understand the basics of Data Acquisition Systems / Industrial Systems, in order to integrate them correctly and efficiently into Data logger systems.</li> <li>- To understand the errors and limits sources and apply methods for reducing the unwanted effects</li> </ul>
	Acquired skills (what the student is able to do):	<p>After completing the discipline, the students will be able to:</p> <ul style="list-style-type: none"> <li>- define a data acquisition system;</li> <li>- develop required specifications depending on the application;</li> <li>- create a structure of a data acquisition system;</li> <li>- develop specifications for the functional blocks;</li> <li>- design the functional blocks of data acquisition system;</li> <li>- realized the hardware test and the calibration of the system;</li> <li>- use the data acquisition system;</li> <li>- functional analyzing and performances of data acquisition system;</li> <li>- defined/created the soft applications of of data acquisition system.</li> </ul>
	Acquired abilities: (what type of equipment the student is able to handle)	<p>After completing the discipline, the students will be able to:</p> <ul style="list-style-type: none"> <li>- use LabVIEW, LabVIEW FPGA;</li> <li>- use FPGA circuits and systems where are included.</li> </ul>
	In accordance with Grila1 and Grila2 RNCIS	N.A.
Cross competences (Grila1 and Grila2 RNCIS)	N.A.	

## 7. Discipline objectives (as results from the key competences gained)

7.1	General objectives	Developing skills regarding analysis and design of the data acquisition systems
7.2	Specific objectives	<ol style="list-style-type: none"> <li>1. Assimilation of theoretical knowledge on the functioning and performances of the support circuits for DAC and ADC.</li> <li>2. Obtaining the necessary skills to: develop, designing (and computer aided design) and analyze the data acquisition systems.</li> </ol>

## 8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Defining a Data Acquisition System. Specific Parameters.	Presentation, heuristic conversation, exemplification, teaching exercise, case study, formative evaluation	Use of .ppt presentation, projector, blackboard
2	Adapting the Data Acquisition System to the required application.		
3	Data Acquisition System Structure. Informational path.		
4	Intermediate data processing.		
5	Specifying the structural blocks.		
6	Performance / structure / price ratio.		
7	Conditioning stages design.		
8	ADC design.		
9	Embedded system design.		
10	DAC and output amplifiers design.		
11	Communication paths. Distributed Data Acquisition System.		
12	Block and system calibration. Functional and performance analysis.		
13	Data Acquisition System software component.		
14	Recapitulation. Preparation for the final exam.		
8.2. Applications (project)		Teaching methods	Notes
1	Defining a Data Acquisition System. Specific Parameters.	Presentation, exemplification, case study, formative evaluation	
2	Data Acquisition System Structure. Informational path.		
3	Conditioning stages design.		
4	Variable gain amplifiers ADC design.		
5	Embedded system design.		
6	Processing and displaying data.		
7	Project presentation.		
8.3. Applications (lab.)		Teaching methods	Notes
1	General presentation of LabVIEW FPGA and SPARTAN-3E Starter Kit board	Didactic and experimental proof, didactic exercise, team work	Use of laboratory instrumentation, experimental boards, computers
2	LabVIEW FPGA project implementation .		
3	Events counter for the rotary encoder.		
4	T1. Digital thermometer. (test)		
5	T2. Signal generator. (test)		
6	T3. LCD controller. (test)		
7	Lab recovery and finalization of laboratory activity		
<b>Bibliography</b>			
1. M. Dăbâcan – Data Acquisition Systems Fundamentals, Casa Cărții de Știință, ISBN 973-686-566-5, 295 pagini, Cluj-Napoca, 2004.			
2. Liviu Viman, Septimiu Pop – Data acquisition systems – Applications development with LabVIEW FPGA and Spartan-3E Starter Kit Board, Cluj-Napoca, Romania: U.T.PRESS, 2015, ISBN: ?, 97p – under printing.			
3. Jack Ganssle et al. – Embedded Hardware: Know It All, Newnes, ISBN: 978-0-7506-8584-9, 2008.			
4. Robert Oshana, Mark Kraeling – Software Engineering for Embedded Systems – Methods Practical Techniques and Applications, Elsevier, ISBN: 978-0-12-415917-4, 2013.			
<b>On-line references</b>			
1. L. Viman, S. Pop - "Data Acquisition Systems – Lab Themes ", UTCN, site: <a href="http://www.ael.utcluj.ro/ORGANIZARE/curs_SAD.HTML">http://www.ael.utcluj.ro/ORGANIZARE/curs_SAD.HTML</a> , 60 pagini, Cluj-Napoca, 2009.			

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

Competences acquired will be used in the following COR occupations (Electronics Engineer; Telecommunications Engineer; Electronics Design Engineer; System and Computer Design Engineer; Communications Design Engineer) or in the new occupations proposed to be included in COR (Sale Support Engineer; Multimedia Applications Developer; Network Engineer; Communications Systems Test Engineer; Project Manager; Traffic Engineer; Communications Systems Consultant).

## 10. Evaluations

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		The level of acquired theoretical knowledge and practical skills		Summative evaluation written exam (E)		40%
Applications		The level of acquired abilities		practical lab test (T1, T2, T3)		30%
Project		The level of acquired abilities		P		30%
10.4 Minimum standard of performance						
$L \geq 5$ ( $L = (T1+T2+T3)/3$ ) and $P \geq 5$ and $E \geq 4$ and $NF \geq 4.5$ where $NF = 0.3*L + 0.3*P + 0.4*E$ .						

Date of filling in  
01.10.2018

Course responsible  
Assoc. Prof. Liviu Viman, PhD

Teachers in charge of applications  
Assoc. Prof. Septimiu Pop, PhD