

## SYLLABUS

### 1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications and information Technology
1.3 Department	Applied Electronics
1.4 Field of study	Electronic Engineering, Telecommunications and Information Technologies
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-E109.00

### 2. Data about the subject

2.1 Subject name	Data Acquisition Systems						
2.2 Subject area	Theoretical area						
	Methodological area						
	Analytic area						
2.3 Course responsible	Assoc. Prof. Liviu Viman, Ph.D – liviu.viman@ael.utcluj.ro						
2.4 Teacher in charge with seminar / laboratory / project	Assoc. Prof. Liviu Viman, Ph.D – liviu.viman@ael.utcluj.ro						
	Assoc. Prof. Septimiu Pop, Ph.D – septimiu.pop@ael.utcluj.ro						
2.5 Year of study	IV	2.6 Semester	2	2.7 Assessment	V	2.8 Subject category	DS/DFac

### 3. Estimated total time

3.1 Number of hours per week	5	of which: 3.2 course	2	3.3 seminar / laboratory	3
3.4 To Total hours in the curriculum	70	of which: 3.5 course	28	3.6 seminar / laboratory	42
Distribution of time					hours
Manual, lecture material and notes, bibliography					24
Supplementary study in the library, online specialized platforms and in the field					-
Preparation for seminars / laboratories, homework, reports, portfolios and essays					24
Tutoring					5
Exams and tests					2
Other activities: .....					-
3.7 Total hours of individual study	55				
3.8 Total hours per semester	125				
3.9 Number of credit points	5				

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

4.1 curriculum	-
4.2 competence	-

### 5. Requirements (where appropriate)

5.1. for the course	Amphitheatre, Cluj-Napoca
5.2. for the laboratories / projects	Laboratory, Cluj-Napoca

### 6. Specific competences

Professional competences	N/A
Transversal competences	N/A

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

7.1 General objective	Developing skills regarding analysis and design of the data acquisition systems
7.2 Specific objectives	1. Assimilation of theoretical knowledge on the functioning and performances of the support circuits for DAC and ADC. 2. Obtaining the necessary skills to: develop, designing (and computer aided design) and analyze the data acquisition systems.

### 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. DAC and output amplifiers design.		
10. Embedded system 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.		
Bibliography		
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, Ioan Ciascai - Sisteme de achiziție de date – Măsurarea traductoarelor cu coardă vibrantă și rezistive din construcțiile hidrotehnice, Cluj-Napoca, Romania, Ed. Mediamira, 229 pagini, ISBN: 978-973-713-332, 2015.
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.

8.2 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. Evaluation (P).		

**Bibliography**

1. Liviu Viman, Septimiu Pop, Ioan Ciascai - Sisteme de achiziție de date – Măsurarea traductoarelor cu coardă vibrantă și rezistive din construcțiile hidrotehnice, Cluj-Napoca, Romania, Ed. Mediamira, 229 pagini, ISBN: 978-973-713-332, 2015.
2. Jack Ganssle... [et al.] – Embedded Hardware: Know It All, Newnes, ISBN: 978-0-7506-8584-9, 2008.
3. Robert Oshana, Mark Kraeling – Software Engineering for Embedded Systems – Methods Practical Techniques and Applications, Elsevier, ISBN: 978-0-12-415917-4, 2013.
4. On – line references.

8.3 Laboratory	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. Digital thermometer. (T1)		
5. Signal generator. (T2)		
6. LCD controller. (T3)		
7. Lab recovery and finalization of laboratory activity		

**Bibliography**

1. Liviu Viman, Septimiu Pop, Ioan Ciascai - Sisteme de achiziție de date – Măsurarea traductoarelor cu coardă vibrantă și rezistive din construcțiile hidrotehnice, Cluj-Napoca, Romania, Ed. Mediamira, 229 pagini, ISBN: 978-973-713-332, 2015.
2. Jack Ganssle... [et al.] – Embedded Hardware: Know It All, Newnes, ISBN: 978-0-7506-8584-9, 2008.
3. Robert Oshana, Mark Kraeling – Software Engineering for Embedded Systems – Methods Practical Techniques and Applications, Elsevier, ISBN: 978-0-12-415917-4, 2013.
4. On – line references.

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

The discipline content and the acquired skills are in agreement with the expectations of the professional organizations and the employers in the field, where the students carry out the internship stages and/or occupy a job (in the field of design of electronic circuits), and the expectations of the national organization for quality assurance (ARACIS).

## 10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The level of acquired theoretical knowledge and practical skills	Summative evaluation written exam (E).	40%
10.5.1 Project	The level of acquired knowledge and abilities	Evaluation (P)	30%
10.5.2 Laboratory	The level of acquired knowledge and abilities	Laboratory tests (T1, T2, T3)	30%

### 10.6 Minimum standard of performance

#### Qualitative level:

##### Minimal knowledge:

- ✓ Knowledge of the main properties and performances of the support circuits for ADC and DAC.
- ✓ Knowledge of the properties and characteristics of the functional blocks from the data acquisition systems structure
- ✓ Knowledge of the software interaction techniques with data acquisition systems




##### Minimal skills:

- ✓ To be able to mention the main properties of the support circuits for ADC and DAC
- ✓ To be able to specify the main features of the functional blocks from the data acquisition systems structure

#### Quantitative level:

- ✓ Perform all laboratory work
- ✓ The exam and laboratory notes must be at least 5
- ✓ The discipline note is calculated with the relation:

**$0,4 * \text{Nota\_examen} + 0,3 * \text{Nota\_laborator} + 0,3 * \text{Nota\_proiect}$**  where the laboratory note is calculated with the relation:  **$\text{Nota\_laborator} = (\text{T1} + \text{T2} + \text{T3}) / 3$**

Date of filling in:	Responsible	Title Surname NAME	Signature
29.09.2020	Course	Assoc. Prof. Liviu Viman, Ph.D	
	Applications	Assoc. Prof. Liviu Viman, Ph.D	
		Assoc. Prof. Septimiu Pop, Ph.D	

Date of approval in the Department of Communications 30.09.2020	Head of Communications Department Prof. Virgil DOBROTA, Ph.D.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology 30.09.2020	Dean Prof. Gabriel OLTEAN, Ph.D.