



Universidad
Politécnica
de Cartagena

Campus
de Excelencia
Internacional

**DATA ACQUISITION AND
PROCESSING IN SCIENTIFIC
EXPERIMENTS
(ADQUISICIÓN Y PROCESAMIENTO
DE DATOS EN EXPERIMENTOS
CIENTÍFICOS)**

Transversal Activities of Doctorate

Universidad Politécnica de Cartagena

1. General course information			
Name	Data acquisition and processing in scientific experiments		
Level	Doctorate		
Academic Year	2015-2016		
University	Universidad Politécnica de Cartagena		
Language	English / Spanish		
ECTS	1	hours / ECTS	10
Total hours			30

2. Lecture data			
Lecturer in charge	Joaquín Roca González		
Department	Tecnología Electrónica		
Knowledge area	Tecnología Electrónica		
Office location	ETSII – Antiguo Hospital de Marina - 1 st Floor		
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URL / WEB			
Office hours	Tuesday 10:00 – 13:00 / Thursday 10:00 – 13:00 (2 nd semester) Monday 11:00 – 14:00 / Monday 15:00 – 18:00 (1 st semester)		

3. Course objectives
<p>This course aims to provide students with the skills required for the successful development of virtual instruments for experimental data acquisition and processing.</p> <p>For this purpose, Labview programming basics will be covered first. Later on, real application programming and advanced techniques will be discussed. In this sense, file access (text/binary), user I/O, data acquisition, peripheral & network communications and image handling will be introduced through real life examples.</p> <p>Students will be provided with an individual student license for National Instruments Labview. No special hardware is required, though a standard microphone is recommended for audio acquisition; serial ports will be emulated through software.</p>

4. Theory/Practical programme
<p>This course has been conceived from an experiment based learning point of view. In this sense, students will be provided with the source code for different programs covering each one of the topics. After executing them, a lab questionnaire shall be filled (40% of the final grade).</p>

Students shall completely design a sample application at home (60% of the grade).

Contents have been structured in 5 interactive 2-hour labs (105 min lab + 15 min questionnaire).

Lab 1: Labview programming fundamentals:

- Labview environment: Software installation & graphical user interface
- Programming aids, toolbars, palettes, context help
- Basic commands
- Front Panel & Diagram
- Controls, Indicators and functions
- Terminals, wiring and data types
- Elemental functions
- Running and debugging

Lab 2: Execution control and programming structures (2 hours):

- For-Loops: Arrays, indexing, graphics and shift registers
- While-Loops: Boolean controls, timing functions and local variables
- Case structure: Menu controls and default values
- Sequence structure, value passing

Lab 3: Application programming (2 hours)

- Requirements identification
- Application architecture
- Clusters and arrays
- Compiling & debugging
- Executable generation
- Documenting applications

Lab 4: Data acquisition and storage (2 hours)

- Text file access
- Binary file access
- Human input devices: Keyboard, Mouse, Joystick
- Analog data acquisition: Sound card input & output
- Data acquisition devices, analog I/O, digital I/O, counters

Lab 5: Advanced programming techniques (2 hours)

- Serial communications (RS232, USB, Bluetooth)
- Network communications (TCP/IP, UDP)
- Communicating with external applications (EXCEL)
- Image & Graphics
- Report generation

5. Hours distribution			
Activity	Location	Student work	Hours
Interactive labs	Classroom (presential)	Attend class	8,75
	Home (distance learning)	Homework: study of the theory contents	8
Individual Project (60% grade)	Home	Design of a sample application	10
Tests (40% grade)	Classroom (presential)	Test Taking	1,25
	Home (distance learning)		
Tutoring	Virtual	Virtual	2
			30