Data acquisition and processing in scientific experiments

(Adquisición y procesamiento de datos en experimentos científicos)

Actividades Transversales

Universidad Politécnica de Cartagena

2016-2017

1. General course information

Name	Data acquisition and processing in scientific experiments
Level	Doctoral / Ph.D. Course
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 - 1St Floor
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URL / WEB	
Office hours	Tuesday 10:00 – 13:00 / Thursday 10:00 – 13:00 (2nd semester) Monday 11:00 – 14:00 / Monday 15:00 – 18:00 (1st semester)

3. Course objectives

This course aims to provide students with the skills required for the successful development of virtual instruments for experimental data acquisition and processing.

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.

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 trough software.

4. Theory/Practical programme

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).

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) Home (distance learning)	Attend class	**8,75**
		Homework: study of the theory contents	**8**
Individual Project (60% grade)	Home	Design of a sample application	**10**
Tests (40% grade)	Classroom (presential) Home (distance learning)	Test Taking	**1,25**
Tutoring	Virtual	Virtual ….	**2**
			30