

Course Unit	Option 3 - Data Acquisition Systems		Field of study	Electronics and Instrumentation	
Master in	Mechanical Engineering		School	School of Technology and Management	
Academic Year	2023/2024	Year of study	2	Level	2-2
Type	Semestral	Semester	1	ECTS credits	6.0
			Code	5071-793-2102-02-23	
Workload (hours)	162	Contact hours	T	-	TP
			PL	60	TC
			S	-	E
			OT	-	O

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) José Augusto de Almeida Pinheiro Carvalho, Thadeu Vinicius de Brito

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. understand the behaviour of data acquisition blocks and its importance in the measurement process;
2. use dedicated data acquisition hardware;
3. use virtual instrumentation software to support data acquisitions systems development;
4. develop skills in the data acquisition systems design domains.

Prerequisites

Before the course unit the learner is expected to be able to:

1. know the fundamentals of circuit theory;
2. use and to understand the behaviour of electronic analog and digital circuits.

Course contents

Elements of data acquisition system. Sample data systems theory. PC based data acquisition systems. Virtual instrumentation software LabVIEW, Matlab. Supervisory Control and Data Acquisition SCADA.

Course contents (extended version)

1. Data acquisition system:
 - concepts and types of acquisition systems.
2. Elements of a data acquisition system: blocks.
 - transducers;
 - signal conditioning;
 - signal conversion.
3. Sample data systems theory. Sample errors:
 - quantization errors;
 - tracking errors and aliasing errors.
 - sample rate selection.
4. PC based data acquisition systems.
 - Hardware and software for data acquisition systems.
 - Bus systems and protocols to support data acquisition.
5. Remote data and telemetry systems.
6. Software to support virtual instrumentation:
 - LabVIEW and Matlab;
 - programming and data acquisition application development.
7. Supervisory Control And Data Acquisition SCADA: concepts, architectures, and trends.

Recommended reading

1. H. Rosemary Taylor. Data Acquisition for Sensors Systems, Chapman & Hall, 1997. ISBN: 0-412-78560-9.
2. John G. Webster, The Mesurement, Instrumentation, and Sensors Handbbook, CRC Press, 1998.
3. José Augusto Carvalho, Apontamentos sobre programação e utilização do LabVIEW.

Teaching and learning methods

Lectures: presentation of the course contents supported on real applications examples. Problem-solving, project or laboratory: use of technological solutions on data acquisition domains. Development of a small data acquisition applications supported on virtual instrumentation software. Non-presential hours: implementation of laboratory experiments and work out the results in reports.

Assessment methods

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 50%
 - Practical Work - 50%

Language of instruction

Portuguese

Electronic validation

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01-10-2023	11-10-2023	12-10-2023	20-10-2023