[MSB001] Data acquisition and signal theory

GENERAL INFORMATION

Studies	MASTER DEGREE IN SMART ENERGY SYSTEMS			**Subject**	Monitoring and diagnosis
Semester	1	**Course**	1	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2022	**Modality**	Face-to-face	**Language**	CASTELLANO
Credits	4,5	**Hours/week**	0	**Total hours**	63 class hours + 49.5 non-class hours = **112.5 total hours**

PROFESSORS

DOK-URKIZU AROCENA, JUNE
LIZEAGA GOIKOETXEA, AITOR

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	LabVIEW core 1. Analog systems and signals analysis and representation in frequency domain.

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MSR051 - Apply signal processing and analysis functions in industrial acquisition systems for data ingestion in energy applications		x		1,92
MSR052 - Implement energy measurement and monitoring applications through a rapid prototyping system		x		2,22
MSR171 - Ability to work in multidisciplinary teams and in a multilingual environment	x		x	0,08
MSR222 - Exhibits, argues and defends the results obtained in the work carried out before a panel of judges			x	0,08
MSR251 - Develops a project in the field of energy systems in a practical application context		x		0,2
			Total:	**4,5**

KC: Knowledge or Content / SK: Skills / AB: Abilities

SECONDARY LEARNING RESULTS

RMS109 **[!]** ***Aplicar funciones de tratamiento y análisis de señales en sistemas de adquisición industriales para la ingesta de datos en aplicaciones de energía***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	9 h.	6 h.	15 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.		2 h.
Computer simulation exercises, individually and/or in teams	3 h.	7 h.	10 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	11 h.		11 h.
Carrying out exercises and solving problems individually and/or in teams	3 h.	7 h.	10 h.

EVALUATION SYSTEM	W
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	33%
Individual written and/or oral tests or individual coding/programming tests	67%

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 28 h.
NCH - Non-class hours: 20 h.
TH - Total hours: 48 h.

RMS110 **[!]** ***Implementar aplicaciones de medida y monitorización mediante un sistema de prototipado rápido***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	12 h.	8 h.	20 h.
Computer simulation exercises, individually and/or in teams	10 h.	12,5 h.	22,5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	13 h.		13 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	67%
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	33%

MAKE-UP MECHANISMS

Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems

CH - Class hours: 35 h.
NCH - Non-class hours: 20,5 h.
TH - Total hours: 55,5 h.

RMS171 **[!]** ***Es capaz de trabajar en equipos multidisciplinares y en un entorno multilingüe***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		2 h.	2 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%

MAKE-UP MECHANISMS

(No mechanisms)

CH - Class hours: 0 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 2 h.

RMS222 **[!]** ***Expone, argumenta y defiende ante un tribunal los resultados obtenidos en el trabajo desarrollado***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		2 h.	2 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%

MAKE-UP MECHANISMS

(No mechanisms)

CH - Class hours: 0 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 2 h.

RMS251 **[!]** ***Desarrolla un proyecto del ámbito de los sistemas energéticos en un contexto de aplicación práctica***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		5 h.	5 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%

MAKE-UP MECHANISMS

(No mechanisms)

CH - Class hours: 0 h.
NCH - Non-class hours: 5 h.
TH - Total hours: 5 h.

CONTENTS

Data acquisition:

1. LabVIEW basics review.
2. Effective and maintainable programming.
    1. Event driven structure.
    2. Queues.
    3. Error management.
3. User interface improvements.
4. Parallel programming.
    1. Parallel loops.
    2. Producer/consumer structure.
    3. Channeled Message Handler.
5. Data reading through FPGA.

Signal theory:

1. Introduction to digital signal processing.
    1. Advantages and limitations of digital processing.
    2. Analog-digital conversion.
2. Discrete signals.
    1. Sampling theory.
        1. Time analysis.
        2. Frequency analysis.
3. Discrete Linear Time Invariant Systems (LTI).
    1. Introduction and definition.
    2. Impulse response and convolution.
    3. Finite Impulse Response (FIR) digital filters.
    4. Z transform.
        1. Introduction and definition.
        2. Representation of discrete LTI systems using the Z transform.
    5. Infinite Impulse Response (IIR) digital filters.

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	Acceso online a bibliografía: https://labur.eus/7A5o6
Topic related web quires	
Computer practical training	