[GJK306] INSTRUMENTATION AND CONTROL

GENERAL INFORMATION

Studies	DEGREE IN MECHATRONICS ENGINEERING			**Subject**	?
Semester	2	**Course**	3	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2025	**Modality**	Face-to-face	**Language**	EUSKARA/CASTELLANO/ENGLISH
Credits	4,5	**Hours/week**	3.75	**Total hours**	67.5 class hours + 45 non-class hours = **112.5 total hours**

2030 AGENDA GOALS

PROFESSORS

ALMANDOZ LARRALDE, GAIZKA
ARANGUREN DERIOZPIDE, JON

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
MODELING AND SIMULATION OF DYNAMIC SYSTEMS	*(No previous knowledge required)*

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GJR317 - To know and apply the basic principles of fluid mechanics and thermodynamics applied to the resolution of engineering problems			x	3,78
G-TR1 - To develop interdisciplinary projects specific to their specialty and of gradual complexity, - becoming aware of respect for human rights and fundamental rights, and analyzing and assessing the impact of the proposed solutions on the SDGs - to acquire and/or apply basic, advanced and/or avant-garde, demonstrating the ability to work in multidisciplinary teams and/or undertake further studies with a high degree of autonomy		x		0,4
G-TR2 - To express information, ideas and the arguments that support them in an orderly, clear and coherent manner, orally and in writing, based on quality information, self-made or obtained from different sources, using inclusive and non-discriminatory language		x		0,32
			Total:	4,5

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

SECONDARY LEARNING RESULTS

RGJ322 **They design and implement measurement systems in industrial applications**

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	5,5 h.	4 h.	9,5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	12,5 h.	6 h.	18,5 h.
Carrying out exercises and solving problems individually and/or in teams	5 h.	5,5 h.	10,5 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	50%
Individual written and/or oral tests or individual coding/programming tests	50%

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests
Comments: Final grade= Initial grade*0,25+Make Up grade*0,75

CH - Class hours: 23 h.
NCH - Non-class hours: 15,5 h.
TH - Total hours: 38,5 h.

2RGJ392 **(2 sem) Identify and accurately discuss the SDGs that the project addresses, suggesting possible actions for improvement.**

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	2 h.	1 h.	3 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)*

CH - Class hours: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 h.

2RGJ390 (2 sem) Define and manage the objectives and planning of a project that allows you to acquire and/or reinforce your knowledge of technologies—sometimes reaching the cutting edge of knowledge—and define an effective self-learning strategy.

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	2 h.	2 h.	4 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)* **Comments:** Continuous assessment. Retake is not foreseen.

CH - Class hours: 2 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 4 h.

2RGJ393 (2 sem)Prepare the project report, providing detailed arguments and using language that is correct, inclusive, and non-discriminatory.

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.	4 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)* **Comments:** Revision and correction of the written report of the semester project.

CH - Class hours: 2 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 4 h.

2RGJ391 (2 sem) Coordinate the work team, encouraging cohesion and a positive atmosphere to achieve the integration of all individuals and their contribution to achieving appropriate performance, both individually and as a group, for the development o(2 sem)

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	2 h.	1 h.	3 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)* **Comments:** Continuous assessment. Retake is not foreseen.

CH - Class hours: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 h.

2RGJ394 (2 sem) Give an oral presentation of the project, justifying the proposed solutions with detailed and precise arguments, and using language that is correct, inclusive, and non-discriminatory.

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.	4 h.

EVALUATION SYSTEM	W	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	100%	*(No mechanisms)* **Comments:** Continuous assessment. Retake is not foreseen.

CH - Class hours: 2 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 4 h.

RGJ3323 They implement basic closed-loop control systems

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	3,5 h.		3,5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	21 h.	7,5 h.	28,5 h.
Carrying out exercises and solving problems individually and/or in teams	10 h.	14 h.	24 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	100%	*(No mechanisms)* **Comments:** Final grade= Initial grade*0,25+ Make Up grade*0,75

CH - Class hours: 34,5 h.
NCH - Non-class hours: 21,5 h.
TH - Total hours: 56 h.

CONTENTS

1. - Frequency response analysis

- Frequency response- Bode diagrams- Vibrations2.- Introduction to control systems- Control systems with feedback- Controllers- Steady state accuracy- Closed-loop stability- Root locus3.- Sensor fundamentals- Sensor Specifications (Sensitivity, Linearity, Hysteresis, Resolution, Accuracy, Offset, Response Time, Bandwidth)- Displacement and velocity sensors (Optical Encoders)- Force, pressure sensors (Strain gauges, piezoelectric sensors)- Temperature sensors (RTD, Thermistors, Thermocouples)- Current sensors (Shunt resistor, Hall effect sensor, Current transformer)

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes Moodle Platform	Craig A. Kluever, Dynamic systems: Modeling, Simulation and Control, 1st edition (2015), ISBN: 978-1-118-28945-7. W. Bolton, Instrumentation and control systems, ISBN: 978-0-7506-6432-0 (paper), ISBN: 978-0-0804-7039-9 (online) Paul P.L. Regtien, Sensors for mechatronics, ISBN: 978-0-1239-1497-2 (paper), ISBN: 978-0-1239-4409-2 (online) http://katalogoa.mondragon.edu/janium-bin/janium_login_opac_re_lnk.pl?grupo=MECATRONICA32&ejecuta=10&_ST