Goi Eskola Politeknikoa | Mondragon Unibertsitatea
Course: 2023 / 2024 - Course planning

Mondragon Unibertsitatea
Goi Eskola Politeknikoa
Escuela Politécnica Superior

[GJK205] MODELLING AND SIMULATION OF DYNAMIC SYSTEMS

GENERAL INFORMATION

Studies	DEGREE IN MECHATRONICS ENGINEERING			**Subject**	?
Semester	1	**Course**	3	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2022	**Modality**	Face-to-face	**Language**	CASTELLANO/EUSKARA
Credits	4,5	**Hours/week**	3.75	**Total hours**	67.5 class hours + 45 non-class hours = **112.5 total hours**

PROFESSORS

ALACANO LOITI, ARGIÑE

PANIAGUA AMILLANO, JULEN

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
PHYSICS I	*(No previous knowledge required)*
FOUNDATIONS OF ELECTRICAL ENGINEERING	
MATHEMATICS APPLIED TO ENGINEERING	

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GJR301 - To know and master the modeling and simulation of dynamic systems		x		4,02
G-RTR1 - 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		0,24
G-RTR2 - 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		0,24
			Total:	**4,5**

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

SECONDARY LEARNING RESULTS

RGJ390 **[!]** *Definir y gestionar los objetivos y la planificación de un proyecto que le permita adquirir y/o reforzar los conocimientos de tecnologías específicas de su especialidad,- que en ocasiones llegan a la vanguardia del conocimiento- y definir una estrate*

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	1 h.	2 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:** With the project of the second semester

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

RGJ391 **[!]** *Coordinar el equipo de trabajo, estimulando la cohesión y buen clima para lograr la integración de todas las personas y su contribución para alcanzar un rendimiento apropiado, tanto a nivel individual como grupal, para el desarrollo del proyecto en*

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

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

(No mechanisms)
Comments: With the project of the second semester

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

RGJ393 [!] *Elabora la memoria del proyecto, aportando argumentos elaborados y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.*

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	1 h.	2 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:** Revision and correction of the written report of the semester project

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

RGJ394 [!] *Realiza una presentación oral del proyecto, justificando las soluciones propuestas con argumentos elaborados y precisos, y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.*

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.	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:** With the oral presentation of the project of the second semester

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

RGJ3301 [!] *Modela el comportamiento dinámico de sistemas multifísicos simples mediante funciones de transferencia.*

LEARNING ACTIVITIES	CH	NCH	TH
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	25 h.	12,5 h.	37,5 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests **Comments:** 25%-75% weighting

CH - Class hours: 25 h.

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NCH - Non-class hours: 12,5 h.
TH - Total hours: 37,5 h.

RGJ3302 **[!]** *Simula el comportamiento dinámico de sistemas multifísicos simples*

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	10 h.	6 h.	16 h.
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	10 h.	7 h.	17 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	16,5 h.	13,5 h.	30 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	40%	Individual written and/or oral tests or individual coding/programming tests **Comments:** 25% - 75% weighting
Individual written and/or oral tests or individual coding/programming tests	60%	

CH - Class hours: 36,5 h.
NCH - Non-class hours: 26,5 h.
TH - Total hours: 63 h.

CONTENTS

1.- Introduction to Dynamic Systems and Control

1.1 Introduction

1.2 Classification of Dynamic Systems

1.3 Modeling Dynamic Systems

1.4 Objectives and Course Outline

2.- Modeling Mechanical Systems

2.1 Introduction

2.2 Mechanical Element Laws

2.3 Translational Mechanical Systems

2.4 Rotational Mechanical Systems

3.- Modeling Electrical and Electromechanical Systems

3.1 Introduction

3.2 Electrical Element Laws

3.3 Electrical Systems

3.4 Electromechanical Systems

4.- Standard Models for Dynamic Systems

4.1 Introduction

4.2 Input-Output Equations

4.3 Transfer Functions

4.4 Block Diagrams

4.5 Standard Input Functions

5.- Numerical Simulation of Dynamic Systems

5.1 Introduction

5.2 System Response Using MATLAB Commands

5.3 Building Simulations Using Simulink

5.4 Simulating Linear Systems Using Simulink

6.- Analytical Solution of Dynamic Systems

6.1 Introduction

6.2 Analytical Solutions to Linear Differential Equations

6.3 First-Order System Response

6.4 Second-Order System Response

7.- System Analysis Using Laplace Transforms

7.1 Introduction

7.2 Laplace Transformation

7.3 Inverse Laplace Transformation

7.4 Analysis of Dynamic Systems Using Laplace Transforms

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Moodle Platform Slides of the subject Programmes	Craig A. Kluever, Dynamic systems: Modeling, Simulation andControl, 1st edition (2015), ISBN: 978-1-118-28945-7 http://katalogoa.mondragon.edu/janium-bin/janium_login_opac_re_ln k. pl?grupo=MECATRONICA31&ejecuta=15&_ST