[GJK105] 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	2020	**Modality**	Adapted Face-to-face	**Language**	ENGLISH
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

ARANGUREN DERIOZPIDE, JON

REQUIRED PREVIOUS KNOWLEDGE

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

SKILLS

VERIFICA SKILLS

SPECIFIC

GJCE07 - Knowledge and capacity for modelling and simulation of dynamic systems.

GENERAL

GJCG01 - To be able to take the initiative in problem solving, decision making, creativity, critical thinking, effective communication and the transfer of knowledge and skills in the field of mechatronics engineering

GJCG05 - Developing and designing products, equipment and mechatronic systems while complying with the technical, economic, quality and safety requirements established in the specifications and required by current legislation

BASIC

G_CB1 - To have proven to understand and have knowledge in a field of study based on general secondary education at a level found in advanced textbooks and including concepts at the forefront of their field of study.

G_CB3 - To be capable of gathering and interpreting relevant data (normally within their field of study) in order to make judgements, reflecting on relevant matters of a social, scientific or ethical nature

LEARNING RESULTS

RG301 They assume responsibilities in the team, organizing and planning the tasks to be developed, dealing with contingencies and encouraging the participation of its members.

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	2 h.	1 h.	3 h.

EVALUATION SYSTEM	W
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	100%

MAKE-UP MECHANISMS

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

Comments: With the project of the second semester

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

RG302 They analyze the variables involved in the problem and propose actions for a stable situation.

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	2 h.	1 h.	3 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	100%	Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence **Comments:** With the project of the second semester

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

RG304 **They define the problem, the development of the solution, as well as the conclusions in an effective way, arguing and justifying each of them, making a correct use of the language, in writing.**

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	1 h.	2 h.	3 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	100%	Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence **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.

RG305 **They define the problem, the development of the solution, as well as the conclusions in an effective way, arguing and justifying each one of them, and making a correct use of the language, orally.**

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	1 h.	2 h.	3 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	100%	Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence **Comments:** With the oral presentation of the project of the second semester

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

RGJ3301 **They model the dynamic behavior of simple multiphysical systems through transfer functions**

LEARNING ACTIVITIES	CH	NCH	TH
Presentation of 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 oral tests to assess technical skills of the subject	100%	Individual written and oral tests to assess technical skills of the subject

CH - Class hours: 25 h.
NCH - Non-class hours: 12,5 h.
TH - Total hours: 37,5 h.

RGJ3302 **They simulate the dynamic behaviour of simple multiphysical systems**

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	10 h.	6 h.	16 h.
Practices of problem solving and real or simulated context projects	10 h.	7 h.	17 h.
Presentation of 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
Individual written and oral tests to assess technical skills of the subject	60%
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	40%

MAKE-UP MECHANISMS

Individual written and oral tests to assess technical skills of the subject

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 Programmes Slides of the subject	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_lnk.pl?grupo=MECATRONICA31&ejecuta=15&_ST