

## [MRA108] LINEAR AND NON-LINEAR CONTROL

### GENERAL INFORMATION

<b>Studies</b>	Master's Degree in ROBOTICS AND CONTROL SYSTEMS		<b>Subject</b>	?
<b>Semester</b>	1	<b>Course</b>	1	<b>Mention / Field of specialisation</b>
<b>Character</b>	COMPULSORY		<b>Language</b>	CASTELLANO/EUSKARA
<b>Plan</b>	2023	<b>Modality</b>	Face-to-face	<b>Total hours</b>
<b>Credits</b>	5	<b>Hours/week</b>	0	51 class hours + 74 non-class hours = <b>125 total hours</b>

### PROFESSORS

ECIOLAZA ECHEVERRIA, LUKA
POGGI, TOMASO

### REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	(No previous knowledge required)

### LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
<b>M1R207</b> - [!] <i>Diseñar y simular estrategias de retroalimentación (feedback) para el control de sistemas dinámicos lineales y no-lineales</i>		x		3,2
<b>M1R223</b> - [!] <i>Capacidad de trabajar en equipos multidisciplinares y en un entorno multilingüe y de comunicar, tanto de forma oral como escrita, conocimientos, procedimientos, resultados e ideas relacionadas con los temas afines al máster</i>		x		0,8
<b>M1R224</b> - [!] <i>Capacidad para ejercer su profesión con actitud cooperativa y participativa, y con responsabilidad social</i>		x		0,2
<b>M1R225</b> - [!] <i>Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.</i>		x		0,4
<b>M1R226</b> - <i>To apply the knowledge acquired and your problem-solving skills in new, little-known or changing environments within broader (or multidisciplinary) contexts related to your area of study</i>		x		0,4
<b>Total:</b>				<b>5</b>

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

### CONTENTS

1. Linear algebra recalls
2. Linear and nonlinear dynamical Systems
3. Laplace Transform and Transfer Functions
4. Controllability and Pole-placement
5. Observability and state estimation
6. Output feedback and integral action
7. Lyapunov functions and global stability
8. Nonlinear control design
9. Fuzzy Logic and Fuzzy Control Systems

### LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	K.J. Åström, R.M. Murray, &#8220;Feedback Systems: An Introduction for Scientists and Engineers&#8221;
Moodle Platform	S.L. Brunton, J.N. Kutz, &#8220;Data-Driven Science &
Slides of the subject	

Computer practical training

Engineering&#8221;, Prentice-Hall

J.J. Slotine, W. Li, &#8220;Applied Nonlinear Control&#8221;,  
Prentice-Hall

S. Strogatz, &#8220;Nonlinear Dynamics and Chaos&#8221;

H. Khalil,&#8220;Nonlinear systems&#8221;, Prentice-Hall

A. Isidori, &#8220;Nonlinear Control Systems&#8221;, Springer

E. Trillas, L. Eciolaza, &#8220;Fuzzy Logic&#8221;, Springer

S.L. Brunton - &#8220;Control Bootcamp&#8221; (On-line lessons  
on YouTube)