

[MRC104] ROBOTIC CONTROL SYSTEM

GENERAL INFORMATION

Studies	Master's Degree in ROBOTICS AND CONTROL SYSTEMS	Subject	?
Semester	2	Course	1
Character	OPTIONAL	Mention / Field of specialisation	AUTONOMOUS SYSTEMS - EIT
Plan	2023	Modality	Face-to-face
Credits	3	Hours/week	0
		Language	CASTELLANO/EUSKARA
		Total hours	29 class hours + 46 non-class hours = 75 total hours

PROFESSORS

POGGI, TOMASO
SESAR GIL, IÑIGO

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
LINEAR AND NON-LINEAR CONTROL ROBOTICS: MECHANICS, MODELLING AND SIMULATION	(No previous knowledge required)

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
M1R213 - [!] <i>Resolver tareas de control de manipuladores robóticos en múltiples contextos y diferentes requisitos de funcionamiento</i>			x	2,2
M1R223 - [!] <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		0,2
M1R224 - [!] <i>Capacidad para ejercer su profesión con actitud cooperativa y participativa, y con responsabilidad social</i>		x		0,2
M1R225 - [!] <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
				Total: 3

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

SECONDARY LEARNING RESULTS

RA141 [!] *Diseña un controlador para una aplicación robótica comunicando sus conclusiones de manera argumentada*

LEARNING ACTIVITIES

	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.		2 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	11 h.	22 h.	33 h.

EVALUATION SYSTEM

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

W

100%

MAKE-UP MECHANISMS

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

Comments: All activities (control points, individual and group work, etc.) must have a minimum grade of 5 and an opportunity for recovery (except the PBL). In unapproved training activities (less than 5) the recovery is compulsory and the final grade will be the grade obtained in the recovery. In the activities carried out it is necessary to obtain a minimum mark of 4 to calculate the average mark of the learning result. Otherwise, the note of the learning result will be that of the suspended activity. The system will calculate the final grade with the RA, applying the percentages defined in IKOF.

CH - Class hours: 13 h.

NCH - Non-class hours: 22 h.

TH - Total hours: 35 h.

RA142 [!] *Diseña un controlador para una aplicación robótica en un contexto real o simulado innovando y colaborando de manera activa para evaluar y asumir la responsabilidad social implícita en la propuesta*

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.	7 h.	8 h.
Computer simulation exercises, individually and/or in teams		15 h.	17 h.	32 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	70%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems		
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	30%			
Comments: All activities (control points, individual and group work, etc.) must have a minimum grade of 5 and an opportunity for recovery (except the PBL). In unapproved training activities (less than 5) the recovery is compulsory and the final grade will be the grade obtained in the recovery. In the activities carried out it is necessary to obtain a minimum mark of 4 to calculate the average mark of the learning result. Otherwise, the note of the learning result will be that of the suspended activity. The system will calculate the final grade with the RA, applying the percentages defined in IKOF.				
CH - Class hours: 16 h. NCH - Non-class hours: 24 h. TH - Total hours: 40 h.				

CONTENTS

1. Control Algorithms:
 1. Proportional-Integral-Derivative (PID) control.
 2. Anti-windup.
 3. Feed-forward.
2. Robot dynamics.
3. Motion control with velocity inputs.
4. Motion control with torque/force inputs.
5. Force control and hybrid motion/force control.

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes Moodle Platform Class presentations Computer practical training Slides of the subject	K.J. Åström, R.M. Murray, “Feedback Systems: An Introduction for Scientists and Engineers” K.M. Lynch, F.C. Park, “Modern Robotics” J.J. Slotine, W. Li, “Applied Nonlinear Control”, Prentice-Hall