[MRA104] ADVANCED PLC PROGRAMMING

GENERAL INFORMATION

Studies	Master's Degree in ROBOTICS AND CONTROL SYSTEMS			**Subject**	?
Semester	2	**Course**	1	**Mention / Field of specialisation**	AUTOMATION
Character	OPTIONAL				
Plan	2023	**Modality**	Face-to-face	**Language**	CASTELLANO/EUSKARA
Credits	6	**Hours/week**	0	**Total hours**	57 class hours + 93 non-class hours = **150 total hours**

PROFESSORS

SAEZ DE BURUAGA CORRALES, ASIER
MITXELENA MARTIARENA, EKHI

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
BASIC INDUSTRIAL AUTOMATION	*(No previous knowledge required)*
BASIC PROGRAMMING	

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
M1R205 - [!] *Aplicar soluciones basadas en autómatas para control de procesos y control de posición y velocidad con accionamientos para ejes simples, potenciando el uso de herramientas para el diagnóstico y puesta a punto*			*x*	5,2
M1R223 - [!] *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*		*x*		0,2
M1R224 - [!] *Capacidad para ejercer su profesión con actitud cooperativa y participativa, y con responsabilidad social*		*x*		0,2
M1R225 - [!] *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.*		*x*		0,4
			Total:	6

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

SECONDARY LEARNING RESULTS

RA061 **[!]** ***Desarrolla y valida programas avanzados de autómatas en lenguaje estructurado según el estándar IEC 61131-3 innovando en su propuesta***

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	1 h.	7 h.	8 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	9 h.	8 h.	17 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	5 h.	8 h.	13 h.
Carrying out exercises and solving problems individually and/or in teams	4 h.	8 h.	12 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	30%
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	20%
Individual written and/or oral tests or individual coding/programming tests	50%

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

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

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

final grade with the RA, applying the percentages defined in IKOF.

CH - Class hours: 19 h.
NCH - Non-class hours: 31 h.
TH - Total hours: 50 h.

RA062 **[!]** ***Desarrolla y valida programas de autómatas con funciones estándares predefinidas para el control de posición y velocidad de ejes controlados por servo variador trabajando individualmente y en equipos multidisciplinares***

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	1 h.	8 h.	9 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	9 h.	8 h.	17 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	3 h.	7 h.	10 h.
Carrying out exercises and solving problems individually and/or in teams	6 h.	8 h.	14 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	30%
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	20%
Individual written and/or oral tests or individual coding/programming tests	50%

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

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: 19 h.
NCH - Non-class hours: 31 h.
TH - Total hours: 50 h.

RA063 **[!]** ***Diagnostica y resuelve averías y problemas de interconexión de un sistema automatizado mediante funciones y herramientas avanzadas cooperando para obtener la propuesta de manera participativa***

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	1 h.	7 h.	8 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	9 h.	8 h.	17 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	4 h.	8 h.	12 h.
Carrying out exercises and solving problems individually and/or in teams	5 h.	8 h.	13 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	20%
Presentation and defence of exercises, case studies, computer practical work, simulation practical work,	30%

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

Individual written and/or oral tests or individual

laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems		coding/programming tests
Individual written and/or oral tests or individual coding/programming tests	50%	

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: 19 h.
NCH - Non-class hours: 31 h.
TH - Total hours: 50 h.

CONTENTS

Review

* Sequential machine: start and stop

*Analog signal processing

Content

* Program organization: programs, interruptions and functions

* Modular programming and structuring

  - Code reuse

  - Data types, user data types

  - Teamwork (git or multiuser)

  - Automatic code generation

* Array, dimensionless array treatment, pointers

* Program structuring for technological objects

  - RFID

  - Motion Control

* Stepper motor control

* Robot control with MX Automation

* Proportional valve and servo valve hydraulic axis control

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	https://mall.industry.siemens.com/goos/WelcomePage.aspx?regionUrl=/es&language=es
Technical articles	https://infosys.beckhoff.com/
Moodle Platform	https://www.kuka.com/es-es/productos-servicios/sistemas-de-robot/software/tecnolog%C3%ADas-transversales/kuka-plc-mxautomation
Class presentations	https://www.rta-iberica.es/es
Topic related web quires	
Programmes	