Goi Eskola Politeknikoa Escuela Politécnica Superior

		[MRA101] ELE	CTROM	ECHANICAL	DRIVES			
		GENI	ERAL INI	FORMATION				
Studies	Master's Degree SYSTEMS	in ROBOTICS AND CO	NTROL	Subject	?			
Semester	2	Course 1		Mention / Field of				
Character	COMPULSORY			specialisation				
Plan	2023	Modality Face	e-to-face	Language	ENGLISH	12 non ol	ooo hour	7E total
Credits	3	Hours/week 0		Total nours	hours	+ 43 101-0	ass nours	s = <u>75 total</u>
			PROFES	SSORS				
UGALDE R ITURBE BE	OSILLO, GAIZKA RISTAIN, ION	A						
		REQUIRED	PREVIC		GE			
Subjects					Knowl	edge		
(No specific previous subjects required)				Mechanical system Basic operation prir Basic control theory	modelling nciples of electric	al machine	s	
		LE	ARNING	RESULTS	,			
EARNING RESI	JLTS					кс ѕк	AB	ECTS
1R200 - Identifyi	ng the needs for a	an industrial process or a	n autonom	ous system in the fie	ld of	x		2,4
ectromecnanica 1R223 - Ability to oth orally and in	work in multidisc writing, knowledg	ting the most appropriate siplinary teams and in a r e, procedures, results ar	e. nultilingual nd ideas rel	environment and to o ated to subjects relat	communicate, ted to the	x		0,2
		acquired and your proble	m-solvina s	kills in new, little-kno	own or	x		0,4
<b>1R226</b> - To apply anging environi	the knowledge a ments within broa	der (or multidisciplinary)	contexts re	lated to your area of	Sludy			
1R226 - To apply anging environi	/ the knowledge a nents within broa	der (or multidisciplinary)	contexts re	lated to your area of	Sludy		Total:	3
IR226 - To apply langing environi	/ the knowledge a nents within broa ntent / SK: Skills / AB:	Abilities SECONDA	CONTEXTS RE	lated to your area of			Total:	3
IR226 - To apply langing environi C: Knowledge or Co. RA012 [!] Sele sistema autóno	/ the knowledge a nents within broa ntent / SK: Skills / AB: ecciona e integra mo resolviendo	Abilities SECONDA Abilities Abilitie	contexts re	lated to your area of RNING RESULT inicos necesarios d icación	rs rs lentro del proce	eso a autor	Total:	3 o del
IR226 - To apply langing environi C: Knowledge or Co. RA012 [!] Sele sistema autóno	/ the knowledge a nents within broa ntent / SK: Skills / AB: ecciona e integra mo resolviendo	Abilities SECONDA a los accionamientos el los problemas asociad	Contexts re	lated to your area of RNING RESULT inicos necesarios d icación	ГS lentro del proce СН	eso a autor NCH	Total: matizar o	3 o del TH
RA012 [!] Sele sistema autóno LEARNING AC Development a projects/work e individually anc	/ the knowledge a nents within broa ntent / SK: Skills / AB: ecciona e integra mo resolviendo CTIVITIES nd writing of reco xperience/challer l/or in teams	Abilities SECONDA Abilities Abilitie	ARY LEA lectromeca los a la apl	lated to your area of RNING RESULT inicos necesarios d icación ual material, etc. on stigations carried our	Istudy Ientro del proce <u>CH</u> t	<b>eso a autor</b> <u>NCH</u> 15 h.	Total: matizar o	3 o <b>del</b> 17H 15 h.
RA012 [!] Sele sistema autóno LEARNING AC Development a projects/work e individually and Computer simu	/ the knowledge a nents within broa ntent / SK: Skills / AB: ecciona e integra mo resolviendo CTIVITIES nd writing of reco xperience/challer l/or in teams lation exercises,	Abilities  SECONDA  a los accionamientos el los problemas asociad  rds, reports, presentation ages/case studies/experin individually and/or in teal	ARY LEA ARY LEA Alectromeca los a la apl ns, audiovis mental inve ms	lated to your area of RNING RESULT inicos necesarios d icación rual material, etc. on stigations carried our	TS lentro del proce CH t 4 h.	<b>Pso a autor</b> <u>NCH</u> 15 h. 7 h.	Total: matizar o	3 9 <i>del</i> 15 h. 11 h.
RA012 [!] Sele sistema autóno LEARNING AC Development a projects/work e individually and Computer simu Presentation by procedures ass	<pre>/ the knowledge a nents within broa ntent / SK: Skills / AB: ccciona e integra mo resolviendo CTIVITIES nd writing of reco xperience/challer l/or in teams lation exercises, / the teacher in th sociated with the s</pre>	Abilities  SECONDA  Abilities  Abilities Abilities  Abilities  Abilities  Abilities  Abilities  Abi	ARY LEA lectromeca los a la apl ns, audiovis mental inve ms tory classe	lated to your area of <b>RNING RESULT</b> <i>inicos necesarios a</i> <i>icación</i> ual material, etc. on stigations carried our s, of concepts and	TS lentro del proce CH t 4 h. 14 h.	<b>sso a autor</b> <u>NCH</u> 15 h. 7 h.	Total: matizar o	3 o del TH 5 h. 11 h. 14 h.
RA012 [!] Selections RA012 [!] Selections RA012 [!] Selections LEARNING AC Development a projects/work e individually and Computer simu Presentation by procedures ass EVALUATION	<pre>/ the knowledge a nents within broa // the knowledge a nents within broa // sectional e integra // the teacher in the // or in teams lation exercises, / the teacher in the sociated with the section of the section // section of the section of</pre>	Abilities	ARY LEA lectromeca los a la apl ns, audiovis mental inve ms tory classe W	lated to your area of RNING RESULT inicos necesarios d icación ual material, etc. on stigations carried our s, of concepts and MAKE-UP MECH	Ientro del proce CH t 4 h. 14 h. ANISMS	<b>Iso a autor</b> <u>NCH</u> 15 h. 7 h.	Total: matizar o	3 <b>o del</b> TH 15 h. 11 h. 14 h.
RA012 [!] Selection RA012 [!] Selection RA012 [!] Selection Sistema autóno LEARNING AC Development a projects/work e individually and Computer simu Presentation by procedures ass EVALUATION Reports on the computer exercises, term Presentation ar computer pract laboratory prac project, master	A the knowledge a ments within broat ments within broat ments within broat meter / SK: Skills / AB: Excelona e integra mo resolviendo CTIVITIES and writing of reco xperience/challer //or in teams lation exercises, / the teacher in the sociated with the sociated with the sociated system completion of exec ises, simulation ex- ises, simulation ex- ises, simulation ex- ical work, simulation of defence of exec ical work, term p 's thesis, challenge	Abilities  Abilities  Example a los accionamientos el  SECONDA  Constructionamientos el  Constru	ARY LEA lectromeca los a la apl ns, audiovis mental inve ms tory classe <u>w</u> 10% 30%	lated to your area of RNING RESULT inicos necesarios d icación rual material, etc. on stigations carried our s, of concepts and MAKE-UP MECH Reports on the co exercises, simulat projects, challenge Individual written a coding/programmi	Intro del proce CH t 4 h. 14 h. ANISMS mpletion of exercises, lai es and problems and/or oral tests ing tests	eso a autor NCH 15 h. 7 h. Cises, case boratory ex or individua	Total: matizar o 1 1 studies, t tercises, t	3 o del TH 15 h. 11 h. 4 h. computer term

Course: 2024 / 2025 - Course planning

CH - Class hours: 18 h. NCH - Non-class hours: 22 h. TH - Total hours: 40 h.

**RA011** [!] Identifica la necesidad de accionamientos electromecánicos en procesos industriales y sistemas autónomos y los relaciona con las características técnicas de los diferentes tipos de accionamientos electromecánicos comunicando sus conclusiones de maner

LEARNING ACTIVITIES		СН	NCH	тн		
Development and writing of records, reports, presentation projects/work experience/challenges/case studies/experin individually and/or in teams	ns, audiovi mental inve	sual material, etc. on estigations carried out		4 h.	4 h.	
Computer simulation exercises, individually and/or in team	1 h.	7 h.	8 h.			
Presentation by the teacher in the classroom, in participal procedures associated with the subjects	12 h.		12 h.			
Carrying out exercises and solving problems individually	1 h.	10 h.	11 h.			
EVALUATION SYSTEM	w	MAKE-UP MECHANISMS				
Reports on the completion of exercises, case studies,	10%	Reports on the completion of exercises, case studies, computer				

computer exercises, simulation exercises, laboratory exercises, simulation exercises, laboratory exercises, term exercises, term projects, challenges and problems projects, challenges and problems 30% Presentation and defence of exercises, case studies, Individual written and/or oral tests or individual computer practical work, simulation practical work, coding/programming tests laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems Individual written and/or oral tests or individual 60% 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: 14 h. NCH - Non-class hours: 21 h. TH - Total hours: 35 h.

# CONTENTS

### 1. DRIVE COMPONENT SELECTION

#### 2. SENSORS FOR ELECTRIC DRIVES

Current sensors

Position and velocity sensors

CW: drive component selection

#### 3. CONTROL OF ELECTRIC MACHINES

- 1. Torque control
- + DC machine
- + Brushless AC (vector control)
- 2. Speed control



3. Position control

## LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Subject notes Moodle Platform Bibliography

Mohan, Ned. Electric Machines and Drives, A First Course. John Wiley & Sons. USA. 2012. ISBN: 978-1-118-07481-7