Course: 2024 / 2025 - Course planning

Goi Eskola Politeknikoa Escuela Politécnica Superior

	GENERAL	INFORMATION				
Studies MASTER DEGREE IN SM SYSTEMS			delling and S	mulation of	of energy s	systems
Semester 1 Character COMPULSORY	Course 1	Mention / Field of specialisation				
Plan 2022	Modality Face-to-face	Language CA	STELLANO			
Credits 4,5 Hou	urs/week 0	Total hours 63		49.5 non-	-class hou	rs = <u>112.5</u>
	PROF	ESSORS				
MAZUELA LARRAÑAGA, MIKEL						
IBISATE ALDAY, JON						
	REQUIRED PRE	VIOUS KNOWLEDGE		•		
Subjects ectric power conversion		(No.n	Knowle revious know		uired)	
ectrotechnics delling, simulation and control of multi-phis	sical systems	(100 p		leage req	uncuj	
dening, sinuation and control of mail price		IG RESULTS				
ARNING RESULTS				кс ѕк	AB	ECTS
R021 - Analyse and model power converte				x x		2
R022 - Design and evaluate control structure R171 - Ability to work in multidisciplinary te				x x x	x	2 0,16
R222 - Exhibits, argues and defends the re			nel of		x	0,1
ges R251 - Develops a project in the field of er	nerov systems in a pra	tical application context		x		0,24
					_	
						4 5
		EARNING RESULTS	sistemas ene	ergéticos.	Total:	4,5
: Knowledge or Content / SK: Skills / AB: Abilities				-		4,5
RMS103 [!] Analizar y modelar converti LEARNING ACTIVITIES	idores de potencia y	náquinas eléctricas para s	sistemas ene CH	NCH	π	н
RMS103 [!] Analizar y modelar converti LEARNING ACTIVITIES Personal study and flexible development c foster more meaningful learning	idores de potencia y of concepts and subjec	máquinas eléctricas para s es using active dynamics, to	СН	-	<u></u> 6	н.
RMS103 [!] Analizar y modelar converting LEARNING ACTIVITIES Personal study and flexible development of foster more meaningful learning Conducting tests, giving presentations, pre checkpoints	idores de potencia y of concepts and subjec esenting defences, tak	máquinas eléctricas para s es using active dynamics, to	<u>СН</u> ng 2 h.	NCH 6 h.	<u> </u>	Н h.
RMIS103 [!] Analizar y modelar convertion LEARNING ACTIVITIES Personal study and flexible development of foster more meaningful learning Conducting tests, giving presentations, pre- checkpoints Computer simulation exercises, individual	idores de potencia y of concepts and subjec esenting defences, tak ly and/or in teams	máquinas eléctricas para s is using active dynamics, to ng examinations and/or doir	сн ng 2 h. 14 h.	NCH	<u>л</u> 6 2 20	н h. h.
RMIS103 [!] Analizar y modelar convertion LEARNING ACTIVITIES Personal study and flexible development of foster more meaningful learning Conducting tests, giving presentations, pre- checkpoints Computer simulation exercises, individuall Presentation by the teacher in the classroop procedures associated with the subjects	idores de potencia y of concepts and subjec esenting defences, tak ly and/or in teams om, in participatory cla	máquinas eléctricas para s is using active dynamics, to ng examinations and/or doir sses, of concepts and	CH ng 2 h. 14 h. 8 h.	NCH 6 h. 6 h.	77 6 2 20 8	H h. h. D h. h.
RMS103 [!] Analizar y modelar converta LEARNING ACTIVITIES Personal study and flexible development of foster more meaningful learning Conducting tests, giving presentations, pre- checkpoints Computer simulation exercises, individuall Presentation by the teacher in the classrood procedures associated with the subjects Carrying out exercises and solving problem	idores de potencia y of concepts and subjec esenting defences, tak ly and/or in teams om, in participatory cla ms individually and/or i	máquinas eléctricas para s ts using active dynamics, to ng examinations and/or doir sses, of concepts and n teams	CH ng 2 h. 14 h. 8 h. 7,5 h.	NCH 6 h.	77 6 2 20 8	н h. h.
RMS103 [!] Analizar y modelar convertion LEARNING ACTIVITIES Personal study and flexible development of foster more meaningful learning Conducting tests, giving presentations, precheckpoints Computer simulation exercises, individuall Presentation by the teacher in the classrood procedures associated with the subjects Carrying out exercises and solving problem EVALUATION SYSTEM	idores de potencia y of concepts and subjec esenting defences, tak ly and/or in teams om, in participatory cla ms individually and/or i W	máquinas eléctricas para s ts using active dynamics, to ng examinations and/or doir sses, of concepts and n teams <u>MAKE-UP MECHANI</u>	CH ng 2 h. 14 h. 8 h. 7,5 h. SMS	NCH 6 h. 6 h. 6,5 h.	T 1 6 2 2(8 14	H h. h. D h. h. 4 h.
RMS103 [!] Analizar y modelar convertion LEARNING ACTIVITIES Personal study and flexible development of foster more meaningful learning Conducting tests, giving presentations, precheckpoints Computer simulation exercises, individuall Presentation by the teacher in the classrood procedures associated with the subjects Carrying out exercises and solving problem EVALUATION SYSTEM Reports on the completion of exercises, carcomputer exercises, simulation exercises, simulation exercises, carcomputer exercises, simulation exercises, simulation exercises, carcomputer exercises, simulation exer	idores de potencia y of concepts and subjec esenting defences, tak ly and/or in teams om, in participatory cla ms individually and/or i <u>W</u> ase studies, ^{50%} laboratory	máquinas eléctricas para s ts using active dynamics, to ng examinations and/or doir sses, of concepts and n teams	CH ng 2 h. 14 h. 8 h. 7,5 h. SMS etion of exerce exercises, lab	NCH 6 h. 6 h. 6,5 h. ises, case	71 6 2 2(8 14 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	H h. h. b. h. 4 h. computer
RMS103 [!] Analizar y modelar convertion LEARNING ACTIVITIES Personal study and flexible development of foster more meaningful learning Conducting tests, giving presentations, precheckpoints Computer simulation exercises, individuall Presentation by the teacher in the classrood procedures associated with the subjects Carrying out exercises and solving probler EVALUATION SYSTEM Reports on the completion of exercises, carcomputer exercises, simulation exercises, exercises, term projects, challenges and p Presentation and defence of exercises, carcomputer practical work, simulation practice	idores de potencia y of concepts and subjec esenting defences, tak ly and/or in teams om, in participatory cla ms individually and/or i <u>W</u> ase studies, ^{50%} laboratory oroblems use studies, ^{33%} cal work,	máquinas eléctricas para s ts using active dynamics, to ng examinations and/or doir sses, of concepts and n teams <u>MAKE-UP MECHANI</u> Reports on the comple exercises, simulation of	CH ng 2 h. 14 h. 8 h. 7,5 h. SMS etion of exerce exercises, lab nd problems for oral tests of ests	NCH 6 h. 6 h. 6,5 h. ises, case oratory ex or individua	The studies, concerning the studies of the studies	H h. h. b. h. h. 4 h. computer erm
RMS103 [!] Analizar y modelar converting LEARNING ACTIVITIES Personal study and flexible development of foster more meaningful learning Conducting tests, giving presentations, pre checkpoints Computer simulation exercises, individuall Presentation by the teacher in the classroo	idores de potencia y of concepts and subjec esenting defences, tak ly and/or in teams om, in participatory cla ms individually and/or i <u>W</u> ase studies, ^{50%} laboratory oroblems use studies, ^{33%} cal work, nd of degree roblems	máquinas eléctricas para s ts using active dynamics, to ng examinations and/or doir sses, of concepts and n teams MAKE-UP MECHANI Reports on the comple exercises, simulation projects, challenges a Individual written and/ coding/programming t	CH ng 2 h. 14 h. 8 h. 7,5 h. SMS etion of exerce exercises, lab nd problems for oral tests of ests mark of the v	NCH 6 h. 6 h. 6,5 h. ises, case oratory ex or individua rritten exa	The studies, concerning the studies of the studies	H h. h. b. h. 4 h. computer erm

RMS222 [!] Expone, argumenta y defiende ante un tribunal los resultados obtenidos en el trabajo desarrollado

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LEARNING ACTIVITIES			СН	NCH	ТН
Development and writing of records, reports, presentation projects/work experience/challenges/case studies/experin individually and/or in teams				2,5 h.	2,5 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANI	SMS		
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	100%		(No mech	anisms)	
CH - Class hours: 0 h. NCH - Non-class hours: 2,5 h. TH - Total hours: 2,5 h.					
LEARNING ACTIVITIES Development and writing of records, reports, presentation projects/work experience/challenges/case studies/experin individually and/or in teams			СН	NCH 6 h.	<i>TH</i> 6 h.
EVALUATION SYSTEM	w	MAKE-UP MECHANI	SMS		
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%		(No mech	anisms)	
CH - Class hours: 0 h. NCH - Non-class hours: 6 h. TH - Total hours: 6 h.					
RMS171 [!] Es capaz de trabajar en equipos multidisc	plinares	y en un entorno multilii	ngüe		
LEARNING ACTIVITIES			СН	NCH	тн
Development and writing of records, reports, presentation projects/work experience/challenges/case studies/experin				4 h.	4 h.

individually and/or in teams			
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	100%	(No mechanisms)	-
CH - Class hours: 0 h. NCH - Non-class hours: 4 h. TH - Total hours: 4 h.			

 RMS104 [!] Diseñar y evalúar estructuras de control para convertidores y máquinas eléctricas

 LEARNING ACTIVITIES
 CH
 NCH
 TH

 Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning
 6 h.
 6 h.
 6 h.

 Conducting tests, giving presentations, presenting defences, taking examinations and/or doing
 2 h.
 2 h.

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checkpoints

checkpoints					
Computer simulation exercises, individually and/or in teams			10 h.	6 h.	16 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects			12 h.		12 h.
Carrying out exercises and solving problems individually	and/or in te	eams	7,5 h.	6,5 h.	14 h.
EVALUATION SYSTEM	W	MAKE-UP MECHAN	ISMS		
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	47%	Reports on the comp exercises, simulation projects, challenges	exercises, lab		
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	33%	Individual written and coding/programming		or individual	
Individual written and/or oral tests or individual coding/programming tests	20%				
CH - Class hours: 31,5 h. NCH - Non-class hours: 18,5 h. TH - Total hours: 50 h.					

CONTENTS

1. Converter modelling

- 1.0. Modelling and converter types
- 1.1. Semiconductor's characterization
- 1.2. Analytic model of the converter
- 1.3. Dynamic model of the converter (Equation based)
- 1.3.1. Ideal Load
- 1.3.2. Real Load
- 1.3.3. Thermal Model
- 1.4. Averaged dynamic model of the converter (Low Fidelity)

2. Electric machine modelling

- 2.0 Introduction to electric machines
- 2.1 Space vector theory revision
- 2.2. Modeling of induction motors
- 3. Electric machine control
- 4. Grid connected converters control

5.Modeling and control of a PMSM (challenge)

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	https://labur.eus/HgcNq
Labs	
Moodle Platform	
Lab practical training	
Specific Master Software	
Class presentations	
Programmes	