

[MRD005] SIGNAL PROCESSING

GENERAL INFORMATION

Studies	Master's Degree in ROBOTICS AND CONTROL SYSTEMS	Subject	Interoperability Control Systems
Semester	2	Course	1
Character	OPTIONAL	Mention / Field of specialisation	AUTONOMOUS SYSTEMS - EIT
Plan	2019	Modality	Adapted Face-to-face
Credits	6	Hours/week	0
		Language	ENGLISH
		Total hours	60 class hours + 90 non-class hours = 150 total hours

PROFESSORS

MENDICUTE ERRASTI, MIKEL

OLAIZOLA ALBERDI, JON

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
Circuit Theory	Laplace transform
Mathematics foundations	Mathematics: Complex numbers and basic calculus

SKILLS

VERIFICA SKILLS

SPECIFIC

MRCE17 - Choosing and implementing signal processing algorithms to extract relevant information

GENERAL

MRCG01 - Automating, controlling, maintaining and providing intelligence to industrial processes and autonomous systems while directing innovative projects that guarantee their availability, using and integrating cutting-edge technologies in both industrial and scientific environments, with the ability to deliver advice on the most appropriate alternatives considering the specifications of users and current regulations

CROSS

MRCR1 - Ability to work in multidisciplinary teams and in a multilingual environment and to communicate, both orally and in writing, knowledge, procedures, results and ideas related to subjects related to the Master's degree

MRCR2 - Ability to do their job with a cooperative and participatory attitude, while being socially responsible

BASIC

M_CB7 - To know how to apply the acquired knowledge and competencies and the ability to solve problems in new or unfamiliar contexts within wider (or multidisciplinary) environments related to their field of study

LEARNING RESULTS

RA171 Identifies the mathematical foundations of signal processing and develops them in a practical context both individually and in teams

LEARNING ACTIVITIES

	CH	NCH	TH
Presentation of the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	10 h.	10 h.	20 h.
Individual and team exercises	3 h.	7 h.	10 h.
Individual and/or team computer simulation practice	3 h.	7 h.	10 h.

EVALUATION SYSTEM

	W
Individual written and oral tests to assess technical skills of the subject	50%
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices	50%

MAKE-UP MECHANISMS

Individual written and oral tests to assess technical skills of the subject
 Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices

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.

RA172 Categorizes and evaluates adaptive filtering algorithms and process monitoring cooperating to obtain the proposal in a participatory way

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	5 h.	8 h.	13 h.
Presentation of the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	5 h.	8 h.	13 h.
Individual and team exercises	5 h.	8 h.	13 h.
Individual and/or team computer simulation practice	5 h.	6 h.	11 h.

EVALUATION SYSTEM

	<i>W</i>
Individual written and oral tests to assess technical skills of the subject	40%
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices	30%
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	30%

MAKE-UP MECHANISMS

Individual written and oral tests to assess technical skills of the subject
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

Comments: All activities (control points, individual and group assignments, etc...) must have a minimum grade of 5 and there will be an extra opportunity for those who do not pass in the first try. In case of a second-chance examination, the final grade will be calculated as follows: first try examination grade * 25% + second-chance examination grade * 75%. In the exams it is necessary to obtain a minimum grade of 4 to calculate the average grade of the learning outcome. Otherwise, the learning outcome grade will be the grade of the exam. In all activities with a grade less than 5, recoveries are mandatory.

CH - Class hours: 20 h.

NCH - Non-class hours: 30 h.

TH - Total hours: 50 h.

RA173 Develops and validates the practical use of real-time signal processing algorithms, solving the problems associated with the proposed solution in new or little-known environments

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	7 h.	11 h.	18 h.
Presentation of the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	6 h.	12 h.	18 h.
Individual and team exercises	5 h.	6 h.	11 h.
Individual and/or team computer simulation practice	6 h.	7 h.	13 h.

EVALUATION SYSTEM

	<i>W</i>
Individual written and oral tests to assess technical skills of the subject	40%
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices	30%
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	30%

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second-chance examination grade * 75%. In the exams it is necessary to obtain a minimum grade of 4 to calculate the average grade of the learning outcome. Otherwise, the learning outcome grade will be the grade of the exam. In all activities with a grade less than 5, recoveries are mandatory.

CH - Class hours: 24 h.
NCH - Non-class hours: 36 h.
TH - Total hours: 60 h.

CONTENTS

0. Introduction
1. Mathematical foundation of signal processing
 - 1.1 Discrete systems
 - 1.2 Basic operations
 - 1.3 Spectral analysis
 - 1.4 Z-Transform
2. Signal processing systems
 - 2.1 Digital filters
 - 2.2 Adaptive filters and observers
3. Industrial examples of signal processing systems

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Moodle Platform
Slides of the subject
Specific Master Software

Bibliography

Digital Signal Processing: Principles, Algorithms and Applications, 3rd Edition, J.G. Proakis. D. Manolakis, 1996. Pearson. ISBN: 9780133737622.