[MSB105] ARTIFICIAL INTELLIGENCE IN ENERGY APPLICATIONS

GENERAL INFORMATION

Studies	MASTER DEGREE IN SMART ENERGY SYSTEMS			**Subject**	?
Semester	2	**Course**	1	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2025	**Modality**	Face-to-face	**Language**	EUSKARA/CASTELLANO
Credits	4,5	**Hours/week**	0	**Total hours**	76 class hours + 36.5 non-class hours = **112.5 total hours**

2030 AGENDA GOALS

PROFESSORS

AGUIRRE ORTUZAR, AITOR
IBASQ-PEÑALBA RETES, MARKEL

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	*(No previous knowledge required)*

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MS141 - Predicting time series for the identification of energy resources and optimising the use of energy sources, through the use of Artificial Intelligence.			x	4,02
MS171 - Ability to work in multidisciplinary teams and in a multilingual environment	x		x	0,16
MS222 - Exhibits, argues and defends the results obtained in the work carried out before a panel of judges			x	0,16
MS251 - Develops a project in the field of energy systems in a practical application context		x		0,16
			Total:	4,5

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

SECONDARY LEARNING RESULTS

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

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	4 h.		4 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	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

CH - Class hours: 4 h.
NCH - Non-class hours: 0 h.
TH - Total hours: 4 h.

RMS251 **[!]** ***Desarrolla un proyecto del ámbito de los sistemas energéticos en un contexto de aplicación práctica***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	4 h.		4 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree	50%	*(No mechanisms)*

project, master's thesis, challenges and problems	
Individual written and/or oral tests or individual coding/programming tests	50%

CH - Class hours: 4 h.
NCH - Non-class hours: 0 h.
TH - Total hours: 4 h.

RMS171 **[!]** ***Es capaz de trabajar en equipos multidisciplinares y en un entorno multilingüe***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	4 h.		4 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	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

CH - Class hours: 4 h.
NCH - Non-class hours: 0 h.
TH - Total hours: 4 h.

RMS111 **[!]** ***Predecir series temporales para la identificación de recursos energéticos y optimizar el uso de las fuentes de energía, mediante el uso de la Inteligencia Artificial***

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	9 h.		9 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	35 h.	18,5 h.	53,5 h.
Carrying out exercises and solving problems individually and/or in teams	20 h.	18 h.	38 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	67%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems
Individual written and/or oral tests or individual coding/programming tests	33%	Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 64 h.
NCH - Non-class hours: 36,5 h.
TH - Total hours: 100,5 h.

CONTENTS

1. Optimisation
    1. Fundamentals
    2. Local searches
    3. Population-based searches
    4. Genetic algorithms
    5. Multi-objective optimisation
2. Time series analysis and prediction
    1. Introduction to time series
        1. Types of time signals
        2. Properties of time signals

3. Characterisation of time signals

2. Probability, spectral distribution and stochastic processes
    1. Probability functions
    2. Stochastic processes
3. Statistical models for time signals
    1. Regression models
    2. Smoothing models
    3. Autoregressive models
4. Estimation and prediction of time signals
    1. AR
    2. ARMA
    3. ARIMA
    4. SARIMA

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Moodle Platform	Acceso online a bibliografía: https://labur.eus/aHyaL
Subject notes	
Technical articles	
Topic related web quires	
Moodle Platform	