

IKASTURTEA/ ACADEMIC YEAR 2026/27

IKASGAIA/SUBJECT:	Data Mining	KURTSOA/COURSE:	4th
MODULUA/MODULE:	Automation Technology	KOKAPENA/LOCATION:	7th semester
ESPARRUA/SCOPE:	---	IRAUPENA/DURATION:	125 h
IZAERA/CHARACTER:	Optional course	KREDITUAK/CREDITS:	5 ECTS
KODEA/CODE:	28476	HIZKUNTZA/LANGUAGE:	English
PLANA/PLAN:	2024	IRAKASLEA/TEACHER:	Iratxe González Conde
AIPAMENA/MENTION:	---		

HELBURUA/AIM:	The general objective of this subject is for students to acquire the ability to understand, develop and explain the phases of a data mining project, from data collection and preparation to the application, evaluation and interpretation of models. To this end, the Python programming language will be used, working with Jupyter notebooks executed in the Visual Studio Code development environment. This methodology will allow code, results, graphs and explanations to be combined in the same document, making it easier to follow the complete analysis process. Specific objectives: By the end of the subject, students will be able to: • Use the Python programming language to perform basic data analysis tasks. • Identify and work with the main data types, structures and objects used in Python for data mining. • Import, explore and describe datasets using tools such as pandas, numpy and visualization libraries. • Carry out data preprocessing tasks, including data cleaning, handling missing values, detecting outliers and transforming variables.
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- Apply statistical analysis techniques to support data-driven decision-making.
- Develop data mining models for classification and regression problems.
- Understand the difference between supervised and unsupervised learning techniques.
- Evaluate model performance using appropriate metrics according to the type of problem.
- Interpret the results obtained and communicate conclusions clearly and logically.

To achieve these objectives, different use cases will be worked on, so that students can practically apply the different phases of the life cycle of a data mining project.

IKAS-PROZESUAREN EMAITZAK/LEARNING OUTCOMES

RC3 - Qualitatively and quantitatively solve and analyze engineering problems, linking the various components of the technological product manufacturing process. TYPE: Competencies

RCO2 - Understand the basic principles of programming applied to engineering, as well as to statistics and probability calculus. TYPE: Knowledge or contents

RCO8 - Acquire technical and scientific knowledge in the development, improvement, and innovation of processes and products when facing real business challenges. TYPE: Knowledge or contents

RHE2 - Manage change and innovation by adapting to needs and demands, leading and initiating new situations, and implementing actions that facilitate the involvement of all personnel, analyzing the medium-term impact of one's actions and decisions. TYPE: Skills or abilities

RHE5 - Apply innovation engineering knowledge to proactively contribute to the organization's strategy, adopting an innovative business vision committed to environmental sustainability and gender equity. TYPE: Skills or abilities

RHT1 - Perform analysis, formulation, modeling, and resolution of engineering problems using fundamental sciences and technology. TYPE: Skills or abilities

RHT3 - Analyze and design automated solutions for industrial processes, implementing modeling techniques, and critically evaluating the obtained conclusions. TYPE: Skills or abilities

EDUKIAK/SYLLABUS

Introduction to Data Mining

Concept of data mining, main applications and phases of a project: understanding the problem, data collection, preparation, modelling, evaluation and interpretation of results.

1. Basic and Complex Python Structures

Basic use of the Python language applied to data analysis: variables, data types, lists, tuples, dictionaries, control structures, loops and functions.

2. Libraries for Data Analysis

Introduction to and use of the main Python libraries for data mining: NumPy, Pandas, Matplotlib and Scikit-Learn.

3. Data Preprocessing

Preparation of data before applying models: initial exploration, data cleaning, handling missing values, detecting outliers, transforming variables, encoding categorical variables and scaling numerical variables.

4. Supervised Learning

Concept of supervised learning and application of predictive models based on a target variable.

a. Classification models: Application of models to predict categories or classes, and evaluation using the confusion matrix, accuracy, precision, recall and F1-score.

b. Regression models: Application of models to predict numerical variables, and evaluation using metrics such as MAE, MSE, RMSE and R^2 .

6. Unsupervised Learning

Introduction to data analysis without a target variable. Application of grouping techniques, such as clustering, to identify patterns or groups within the data.

7. Statistics Applied to Decision-Making

Use of basic statistical tools to describe, analyse and interpret data: measures of central tendency, dispersion, correlation, group comparison and hypothesis testing.

The contents will be worked on through use cases.

IRAKASKUNTZA MOTA/TYPE OF TEACHING

	M	CP	PL	PO	SP	D
In person (hours)	20	20	0	0	20	0
Personal work (hours)	25	30	0	0	35	0

M: Master class / CP: Classroom problem-solving class / PL: Laboratory practices / PO: Computer practices / SP: Project seminars / D: Dual

BALIABIDE DIDAKTIKOAK/TEACHING METHODS

- X Explanatory and/or demonstrative sessions by the teacher.
 - X Exercises carried out in the classroom with the help of the teacher.
 - X Practical application through exercises, simulations, and experimentation, either individually or in groups.
- An integrative case study representative of the skills to be acquired through the module.

BIBLIOGRAFIA/LITERATURE

Hernández Orallo, J., Ramírez Quintana, M.J., Ferri, C. *Introducción a la minería de datos*. Pearson Alhambra. (Manual clásico en castellano que cubre todo el proceso de extracción de conocimiento, con ejemplos y herramientas estándar).

Witten, I.H., Frank, E., Hall, M.A. *Data Mining: Practical Machine Learning Tools and Techniques*. 3rd Ed. Morgan Kaufmann, 2011.

EBALUAZIO METODO ETA IRIZPIDEAK/EVALUATION METHODS AND CRITERIA

The assessment tests and activities for this subject will be carried out in accordance with the principles of academic integrity, honesty, and ethical behavior established in the regulations of the Elgoibar Dual Engineering School and the EHU. Upon entering the University, students signed the Declaration of Commitment to Ethical Behavior and Academic Honesty, pledging not to engage in plagiarism, academic fraud, or the use of unauthorized materials or devices (including artificial intelligence tools when not expressly permitted) in academic tests and assignments. Failure to comply with these obligations may lead to the academic and disciplinary consequences provided for in the university regulations in force.

X Continuous Evaluation System

X Final Evaluation System

OHIKO DEIALDIA/ ORDINARY CALL

40 % Written and/or oral test

0 % Completion and/or reporting of internships

60 % Report/Deliverables/Oral Presentations/Projects

0 % Carrying out activities and/or projects in the dual entity

Argibideak/Clarifications:

FINAL assessment criteria:

Assessment activity	Period	Score	Observations
Report / Deliverables / Oral presentations /	Throughout the semester	60 % 0-60 points	If the assignment is not submitted when requested, it will receive 0 points. In order

Projects (Group–individual)			to average this mark with the other sections, a minimum score of 5 out of 10 must be obtained.
Final exam (individual)	Examination period	40 % 0-40 points	In order to average this mark with the other sections, a minimum score of 5 out of 10 must be obtained.

The assessment system will be the same for all enrolled students, as the course will involve different types of activities in addition to the exam, which will be compulsory.

All activities included in the assessment system are equally important. Students who take part in any assessment activity of the course, even if they do not complete all of them, will receive a final grade. Any activities not completed will be awarded a mark of 0, and the corresponding average will be calculated. In order to pass the course, students must meet the defined minimum requirements and obtain a grade equal to or higher than 5 out of 10 when calculating the average of the different sections.

If the minimum required score has not been obtained in any section, the final grade will be calculated as follows: the average will be calculated using all marks, and if the mark obtained in the average:

Average $\geq 4 \rightarrow$ the final grade will be 4.

Average $< 4 \rightarrow$ the final grade will be the mark obtained in the average.

EZOHIKO DEIALDIA/ CALLEXTRAORDINARY

40 % Written and/or oral test

Completion and/or reporting of internships

60% Report/Deliverables/Oral Presentations/Projects

Carrying out activities and/or projects in the dual entity

Argibideak/Clarifications:

FINAL assessment criteria:

The assessment criteria are the same as those applied in the ordinary examination session.

Students who still need to meet the minimum requirement in one or more sections will retain the mark obtained in the section(s) in which the minimum requirement was met, and will only have to retake the part(s) in which they did not achieve the minimum in the ordinary examination session.