

TEACHING GUIDE

1. BASIC INFORMATION

Subject	Environmental Data Analytics
Degrees	Business Engineering (GIE)
Faculties	Faculty of Engineering and Business Technology
ECTS	6
Character	Mandatory
Language	English
Mode	In-person/Synchronous In-person
Semester	Fifth
Subject Coordinator	Javier Martínez Torres

2. PRESENTATION

This course introduces the principles and practices of Environmental Data Analytics, structured into four key units that progressively build the skills and knowledge necessary to tackle environmental challenges using data. Students will start by understanding the fundamentals of environmental data analysis and the role of technologies such as big data and IoT in environmental monitoring. They will then develop proficiency in mathematical modelling, statistical techniques, programming, and data visualization tools for environmental applications. The course concludes with real-world case studies and a final project to integrate predictive modelling, data analysis techniques, and visualization in areas like pollution assessment, water quality, and soil contamination. This comprehensive structure ensures students acquire both theoretical understanding and hands-on experience.

3. COMPETENCIES AND LEARNING OUTCOMES

Type	Code	Description
Basic	BC01	The students have demonstrated knowledge and understanding in an area of study that begins at the foundation of general secondary education and is typically at a level that, while based on advanced textbooks, also includes aspects involving knowledge from the forefront of their field of study.
	BC02	The students know how to apply their knowledge to their work or vocation in a professional manner and possess the skills usually demonstrated through the development and defence of arguments and problem-solving within their area of study.
	BC03	The students have the ability to gather and interpret relevant data (usually within their field of study) to make judgments that include reflection on relevant social, scientific, or ethical topics.
	BC04	The students can convey information, ideas, problems, and solutions to both specialized and non-specialized audiences.
	BC05	The students have developed the necessary learning skills to undertake further studies with a high degree of autonomy.
General	GC01	Solve complex and unpredictable situations systematically, creatively, and with critical judgment, making decisions with

Type	Code	Description
		incomplete information and assuming risks within the field of engineering and business.
	GC02	Effectively determine objectives, priorities, methods, and controls to carry out tasks by organizing activities within the available deadlines and resources in the field of engineering and business.
	GC03	Demonstrate the ability to analyse, synthesize, and evaluate data and information in the field of engineering and business.
	GC04	Work in an international and intercultural context within the field of engineering and business.
	GC05	Utilize the potential of cutting-edge technologies to contribute to improving the competitiveness of the company or organization in the field of engineering and business.
	GC06	Understand and apply local, regional, national, and international regulations in the field of engineering and business.
Transversal	TC01	Demonstrate oral and written communication skills in a foreign language.
	TC02	Solve problems and make decisions by applying knowledge, methods, and tools in their academic and professional field.
	TC03	Demonstrate skills and attitudes for autonomous work and teamwork.
	TC04	Use knowledge, skills, abilities, and attitudes to communicate in digital environments.
Specific	SC01	Apply the stages of a Big Data project for the processing and subsequent analysis of environmental data in the business context.

Code	Description
LO01	Identify environmental data, its structure, characteristics, and volume.
LO02	Select appropriate tools and techniques for exploring environmental data.
LO03	Use IoT in the development of environmental applications.
LO04	Identify and collect different types of environmental pollution data and perform assessments.
LO05	Apply advanced mathematical and statistical techniques and methods for environmental data analysis.
LO06	Use software tools in the context of the course.
LO07	Develop and present a final project.

4. CONTENT

Unit I: Foundations of Environmental Data Analytics

- 1.1. Introduction to environmental data analysis and modelling
- 1.2. Big Data in Environmental Data Analytics
- 1.3. IoT and Environmental Monitoring

Unit II: Mathematical and Statistical Tools for Environmental Data

- 2.1. Mathematical Models Applied to Environmental Data Analytics
- 2.2. Statistics Applied to Environmental Data Analysis

Unit III: Programming and Software for Environmental Data Analysis

- 3.1. Programming Fundamentals for Environmental Data Analysis
- 3.2. Software Tools for Statistics and Data Analysis
- 3.3. Data Visualisation
- 3.4. Predictive Models in Environmental Analysis

Unit IV: Environmental Data Applications

- 4.1. Atmospheric Pollution: Assessment and Data Analysis
- 4.2. Noise and Light Pollution: Assessment and Data Analysis
- 4.3. Water Quality: Techniques for Analysis and Evaluation
- 4.4. Data Analysis Techniques for Polluted Soils
- 4.5. Business Case-studies of Environmental Data Analysis
- 4.6. Final Project

5. TEACHING AND LEARNING METHODOLOGIES

UIE develops an innovative academic model centered on the learner, combining different philosophical approaches to Teaching-Learning (T-L), a wide variety of learning activities—especially those in which students take an active role in knowledge construction—continuous guidance, and the intensive use of technology as a facilitating tool, creating a unique and innovative learning ecosystem.

The training is conducted in an in-person modality, including synchronous virtual learning, supported by a cutting-edge virtual campus that provides flexibility and personalization within a ubiquitous learning (U-Learning) model.

Additionally, in alignment with its founding and corporate principles of social responsibility, UIE not only encourages the participation of its entire university community in volunteer and social service activities but also incorporates the Service-Learning (ApS) approach as a formal component of its teaching-learning strategies.

Code	Activity	Type	E-A Mode	Approach
TM01	Initial Contact and Motivation	I	Introductory	IP
TM03	Lecture	T	Expository and Participatory	IP
TM06	Problem Solving and Exercises	P	Guided/Independent	
TM07	Virtual Campus Activity	T/P		
TM08	Content Study	T	Independent	NP
TM09	Project and Assignment Development	T/P		
TM13	Presentations	T/P	Guided/Independent	
TM16	Use of Software Tools	P		
TM19	Service-Learning (S-L)	T/P	Service-Learning	IP
TM20	Tutorials	T/P	Personalised (Individual/Group)	IP
TM23	Discussion Forums	T/P		
TM25	Monitoring and Completion	C	Continuous Self-Assessment	NP

I: Informative; T: Theoretical; P: Practical; C: Complementary; IP: In-Person; NP: Non-In-Person.

6. TRAINING ACTIVITIES

The following identifies the types of educational activities that will be carried out:

Code	Name	Modality	Type of activity
AF01	Introductory	IP	Motivational/Informative
AF02	Expository and Participatory	IP	Theoretical
AF03	Guided	IP	Theoretical / Practical
AF04	Personalized (Individual / Group)	IP	Theoretical / Practical
AF05	Autonomous	NP	Theoretical / Practical
AF06	Service-Learning	IP	Service-Learning
AF07	Continuous self-assessment	NP	Quality Assessment

IP: In-person NP: Non-in-person

7. EVALUATION

The model also includes the continuous assessment process as an essential part of verifying the competencies acquired. For UIE, and in line with the proposed improvement of the teaching-learning process for the European Higher Education Area (EHEA), the assessment system, called Learning Outcomes Review (LOR), is developed as a more humanized process, distancing itself from traditional systems where students risk their fate in exams (sessions), sometimes with high and decisive percentage weights, leading to stress, frustration, and occasionally, dropout.

The UIE LOR system is continuous, shared, and progressive, allowing for the monitoring of learning throughout the entire period, making it a natural process to which students turn without negative emotions and aware of the need to understand their own progress.

Code	Evaluation Activity	Weighting %	Type	Mode
AE01	Partial Tests	40	Discrete	O/E
AE05	Participation in the Virtual Campus	10	Discrete (Pass/ Fail)	
AE06	Participation, Daily Activities and Volunteering	5	Discrete (Pass/ Fail)	O
AE09	Digital Portfolio	45	Discrete	O/E
AE10	Retake Partial	-	Discrete	W/O
		100		

Mode: O: Oral W: Written O/E: Both

8. BIBLIOGRAPHY

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9. TUTORIALS

MD20 Tutorial (2%): Students must attend at least three personalized tutorials throughout the semester. This is an all-or-nothing activity ("Pass-Fail"), meaning that all three tutorials must be completed.

10. QUALITY SURVEYS

MD25 Quality Management (2%): Students must complete four forms throughout the semester related to UIE's quality management. This is an all-or-nothing activity ("Pass-Fail"), meaning that all four forms must be completed within the deadlines specified in the course activity plan. The activity aims to timely assess the development of the teaching-learning process and the transversal competence related to critical and self-critical thinking.