Course guide
240209 - 240EN36 - Data Science Applied to Electrical Energy Systems

Last modified: 16/05/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN ELECTRIC POWER SYSTEMS AND DRIVES (Syllabus 2021). (Optional subject).
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2022). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: MÒNICA ARAGÜÉS PEÑALBA

Others: MÒNICA ARAGÜÉS PEÑALBA

PRIOR SKILLS

Programming
Statistics
Electrotechniques

TEACHING METHODOLOGY

Teaching methodology:

The course teaching methodologies are as follows:

- Lectures and conferences: presentation of knowledge by lecturers or guest speakers.
- Participatory sessions: collective resolution of exercises, debates and group dynamics, with the lecturer and other students in the classroom; classroom presentation of an activity individually or in small groups.
- Theoretical/practical supervised work (TD): classroom activity carried out individually or in small groups, with the advice and supervision of the teacher.
- Homework assignment of reduced extension: carry out homework of reduced extension, individually or in groups.
- Homework assignment of broad extension: design, planning and implementation of a project or homework of broad extension by a group of students, and writing a report that should include the approach, results and conclusions.
- Evaluation activities (EV).

Training activities:

The course training activities are as follows:

- Face to face activities
o Lectures and conferences: learning based on understanding and synthesizing the knowledge presented by the teacher or by invited speakers.
o Participatory sessions: learning based on participating in the collective resolution of exercises, as well as in discussions and group dynamics, with the lecturer and other students in the classroom.
o Presentations (PS): learning based on presenting in the classroom an activity individually or in small groups.
o Theoretical/practical supervised work (TD): learning based on performing an activity in the classroom, or a theoretical or practical exercise, individually or in small groups, with the advice of the teacher.

- Study activities
o Homework assignment of reduced extension (PR): learning based on applying knowledge and presenting results.
o Homework assignment of broad extension (PA): learning based on applying and extending knowledge.
o Self-study (EA): learning based on studying or expanding the contents of the learning material, individually or in groups, understanding, assimilating, analysing and synthesizing knowledge.

LEARNING OBJECTIVES OF THE SUBJECT

1) Understand the main concepts around Big Data and Machine Learning
2) Understand the potential applications of Machine Learning in the electrical energy sector
3) Learn how to develop a Machine Learning model
4) Explore the main Machine Learning types (Supervised and Unsupervised)
5) Get used to Python coding for Machine Learning applications
6) Develop Machine Learning models for electrical energy problems

STUDY LOAD

Type	Hours	Percentage
Guided activities	15,0	12.00
Hours small group	30,0	24.00
Self study	80,0	64.00

Total learning time: 125 h

CONTENTS

title english

Description:
This course explains data science for power system applications

Specific objectives:
- Introduction to Big Data and Machine learning applications to the electrical energy sector. -
- Creation of a Machine Learning Model: Introduction to Python
- Descriptive statistics
- Supervised learning I: classification
- Supervised learning II: regression
- Unsupervised learning: clustering and dimensionality reduction
- Electric power system applications

Full-or-part-time: 125h
Theory classes: 30h
Guided activities: 15h
Self study : 80h

GRADING SYSTEM

In order to be able to have an evaluation of the subject, it is a necessary condition to have attended, carried out and delivered the reports of all the laboratory assignments and final project. In case this necessary condition is not met, the grade will be NP (Not Presented). If the necessary condition is met, then the calculation will be as follows:
70 % Exam_mark
30 % Lab_reports_mark
There is no re-take exam.

BIBLIOGRAPHY

Basic:
- Brownlee, Jason. Machine Learning Mastery with Python : understand your data, create accurate models and work projects end-to-end. [Lloc de publicació no identificat]: Independently published, 2021. ISBN 9798540446273.

RESOURCES

Other resources:
Kaggle: www.kaggle.com/learn/python
Learn Python: www.learnpython.org
Machine Learning Glossary: https://developers.google.com/machinelearning/glossary />Machine Learning library: https://scikit-learn.org/stable