

## RESEARCH PROJECT 2020-2021

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### Department/Area

Electronics, Automation and Communication

### Title/Name

Survey on blockchain-based transactive energy systems

### Abstract/Description

The electric power system is undergoing a rapid transition toward decarbonization and decentralization due to the availability of new resources such as distributed renewable generation, battery energy storage, electric vehicles and demand response technologies. Such resources are being deployed at the building level transforming passive consumers in active prosumers and offering new business models opportunities. However, an alignment between energy prices with real-time grid conditions is needed, the so-called transactive electricity market models. Meanwhile, distributed ledger technologies such as blockchain are rapidly evolving beyond their initial financial applications to new use cases in sectors such as energy, offering residential and commercial actors a digital platform to directly buy and sell energy with each other. The objective of this research project is to assess the suitability of blockchain for control of distributed energy resources in transactive energy markets, as well as the technologies and methodologies needed for its implementation.

### Prerequisites

Required	Interest in the topic
Recommended	A previous course in electrical systems, communication networks and/or cryptography basics.

### Supervisor/Tutor

Name	Gregorio López López, Pedro Moura
Email	

### Structure

Format	Semester (extensive, 15 weeks), Summer (intensive, preferably 8 weeks), Both are available Nevertheless, taking into account current situation, summer is preferred
Workload	100 hours (4 ECTS) / 200 hours (8 ECTS)
Students	2. The ideal situation would a student with background in power systems and a student with background in communication networks.

## RESEARCH PROJECT 2020-2021

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### Department/Area

Mechanical

### Title/Name

Determination of plastic pollution in sea salts and brines

### Abstract/Description

The research project will consist of the laboratory analysis of brine and salt samples to detect the presence of plastics. The student will quantitatively determine the amount of different plastics by filtration. Ideally, he/she will also determine what type of plastics are being found. We will use samples from 4-6 salt-making locations in Spain and Portugal, and from different stages of the salt-making process. The use of these different samples will allow to understand which stages of the production process are most vulnerable to plastic pollution and provide an indication of the origin of the plastics (i.e. from the environment or from the production process itself). This project is spin-off of the EU-funded Life Salinas project on the protection of saltscapes and their biodiversity. This research falls into the topic of salt quality within the aforementioned Life Salinas project. The student is kindly invited to join one of the main researchers (KHueso) to obtain the samples in the field, provided he/she takes care of his/her own expenses.

### Prerequisites

Required	
Recommended	Experience working in a laboratory

### Supervisor/Tutor

Name	Mar Cledera Castro / Katia Hueso Kortekaas
Email	

### Structure

Format	Summer (intensive, preferably 8 weeks)
Workload	100 hours (4 ECTS) / 200 hours (8 ECTS)
Students	Ideally 2 (1-4)

## RESEARCH PROJECT 2020-2021

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### Department/Area

Mechanical

### Title/Name

Sustainability analysis of different types of table salts

### Abstract/Description

Table salts have experienced a boom in diversity and pricey gourmet versions can be found in high-end retail shops. However, not all these high-range salts are produced by the same methods. There is a gradation between industrial salts, obtained in highly mechanized salt making sites and hand-harvested salts from small salinas. Producers claim their salt is more sustainable than others. The aim of this project is to use a standard tool (Eco-audit) to measure the sustainability of the production of high-range salts and debate the strengths and the flaws of this tool. Four or five different salts will be analyzed (100h). The student wishing to go deeper into this subject will be able to compare other tools to measure sustainability of each salt (indicators, Environmental Impact Assessment) and discuss the strengths and flaws of these tools (extension to 200h).

The research project will include a morphological study of the different salts in the lab.

### Prerequisites

Required	
Recommended	Experience working in a laboratory

### Supervisor/Tutor

Name	Mar Cledera Castro / Katia Hueso Kortekaas
Email	

### Structure

Format	Summer (intensive, preferably 8 weeks)
Workload	100 hours (4 ECTS) / 200 hours (8 ECTS)
Students	1-2

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Questions: [international.icaei@comillas.edu](mailto:international.icaei@comillas.edu)

## RESEARCH PROJECT 2020-2021

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### Department/Area

Mechanical

### Title/Name

Assessment of the recycling performance and environmental awareness among the Comillas University community

### Abstract/Description

This project will assess the environmental awareness and performance of the Comillas University as an institution, as well as its community (professors, students, administrative and services staff). The student will focus on waste management and, to this end, will study the equipment offered as well the information provided to adequately recycle waste in different facilities of the university. The student will also take samples of waste bins and check whether the content is appropriate and analyse possible mismatches. Finally, the student will make a survey among academic and non-academic staff, Spanish and foreign students, to assess their knowledge on how to recycle correctly. The outcomes of the study will serve to propose measures of improvement for the recycling performance at Comillas (targeted awareness campaigns, location and type of bins, etc.).

### Prerequisites

Required	
Recommended	Being creative and social!

### Supervisor/Tutor

Name	Mar Cledera Castro / Katia Hueso Kortekaas
Email	

### Structure

Format	Summer (intensive, preferably 8 weeks)
Workload	100 hours (4 ECTS)
Students	1-2

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Questions: [international.icaicomillas.edu](mailto:international.icaicomillas.edu)

## RESEARCH PROJECT 2020-2021

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### Department/Area

Applied Mathematics

### Title/Name

**PROGRAMMING THE GAME: BINARY WHO IS WHO? FOR THE IMPROVEMENT OF THE TEACHING OF MATHEMATICAL CONCEPTS**

### Abstract/Description

The project consists in the programming of an adaptation of a classical board game, which has been named “Binary who is who?”

### Prerequisites

Required	Manage of some programming language, as Matlab or C
Recommended	Knowledge of a programming language to create online games (game programming)

### Supervisor/Tutor

Name	Javier Rodrigo
Email	

### Structure

Format	Summer (intensive, preferably 8 weeks)
Workload	100 hours (4 ECTS)
Students	2

## RESEARCH PROJECT 2020-2021

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### Department/Area

Institute for Research in Technology

### Title/Name

Optimization of the location of the electricity and hydrogen charging stations in Spain in the medium and long term

### Abstract/Description

This project aims to design an optimization model in the long-term able to optimize the locations of electricity and hydrogen charging stations for Spain, considering, among others, the precise or statistical location of current stations, the hourly traffic density and the degree of penetration of the electrical and hydrogen vehicles. A previous phase of literature revision will be needed to determine how other research works have addressed this problem.

### Prerequisites

Required	Design of Linear Mathematical Programming models
Recommended	Spanish

### Supervisor/Tutor

Name	Francisco Alberto Campos Fernández and José Villar
Email	

### Structure

Format	Semester (extensive, 15 weeks)
Workload	200 hours (8 ECTS)
Students	4

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Questions: [international.icaei@comillas.edu](mailto:international.icaei@comillas.edu)

**Department/Area**

Institute for Research in Technology

**Title/Name**

State of the Art of Brent and Natural Gas prices forecast models

**Abstract/Description**

The purpose of this project is to carry out a review of the state of the art of price forecast models that allow to estimate the Brent and Natural Gas prices. This will help in compiling not only the main modeling approaches but also the most relevant levers in the Brent and Natural Gas prices formation.

**Prerequisites**

Required	
Recommended	

**Supervisor/Tutor**

Name	Francisco Alberto Campos Fernández and José Villar
Email	

**Structure**

Format	Semester (extensive, 15 weeks)
Workload	200 hours (8 ECTS)
Students	2

## Department/Area

Institute for Research in Technology

## Title/Name

Power generation and storage technologies prospective

## Abstract/Description

The purpose of this project is to review the most promising current and expected technologies that could contribute to a future decarbonized generation mix, with the objective to gather essential technical data as well as investment and operation current and expected costs. This analysis will be used to propose simple dispatch models to contribute to the generation mix, as well as to assess their contribution to firm capacity. The technologies should include different technological approaches to solar thermal, batteries, wave power, h2 based thermal generation (combined cycles conversion or new turbines), carbon capture and sequestration, etc.

## Prerequisites

Required	
Recommended	

## Supervisor/Tutor

Name	Francisco Alberto Campos Fernández and José Villar
Email	

## Structure

Format	Semester (extensive, 15 weeks)
Workload	200 hours (8 ECTS)
Students	2