

ENG-601

**Digitalization in electricity systems**

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| Cursus | Sem. | Type |
|--------|------|------|
| Energy |      | Opt. |

|                            |            |
|----------------------------|------------|
| Language of teaching       | English    |
| Credits                    | 2          |
| Session                    |            |
| Exam                       | Term paper |
| Workload                   | 60h        |
| <b>Hours</b>               | <b>40</b>  |
| Lecture                    | 16         |
| Practical work             | 24         |
| <b>Number of positions</b> | <b>10</b>  |

**Frequency**

Every year

**Remark**

The limited number of 10 places will be filled on a first-come first-served basis. Registration closes September 30th, 2023. The course runs from October 9th to 11th, 2023.

**Summary**

Participants will be equipped with specialized knowledge, grounded on latest academic research and professional practice, on potential applications and risks digitalization tendencies pose to the operation and planning of electricity systems.

**Content**

The proposed lecture will consist of the following building blocks:

1. Digital transformation, digitalization and digitization:
  - Definitions, drivers and patterns
  - A short history of digitalization
  - Digitalization theories
2. An overview over digital innovations and technologies
  - Internet-of-Things
  - Big Data
  - Peer-to-peer trading
  - Artificial Intelligence
  - Distributed Ledger
  - and other...
3. Selected applications across the electricity value chain
  - Digital innovation in the electricity sector - An international overview
  - Forecasting techniques for electricity demand and generation
  - Peer-to-peer trading
  - Data hubs for electricity transmission and distribution operators
  - Aggregation of electricity consumers and flexibility
  - Scarcity event analysis in resource adequacy studies

#### 4. Emerging risks through digitalization

- Electricity demand of data centers and infrastructure
- Data privacy
- Cyber attacks and cyber security
- Ethical aspects of artificial intelligence

#### 5. Steering digitalization in the electricity sector

- Policy making an introduction
- Digitalization policies & strategies
- Data privacy and protection policies
- Dynamic regulation and sandboxes
- Regulating AI, cyber security and digital platforms

Content and scope are constantly reviewed and may be slightly updated/adjusted before each edition.

#### Note

The lecture will integrate short presentations from external high-level professionals from the electricity industry, public administration and academia, providing excellent opportunity for networking and idea exchange with leaders in the field.

#### Learning Prerequisites

##### Important concepts to start the course

A good understanding of the planning and operation of electricity systems is recommended.

#### Learning Outcomes

By the end of the course, the student must be able to:

- Develop familiarity with the vocabulary of the digital transformation, its main theories, and possess the tools to analyze and mitigate effects of digitalization on electricity systems.

#### Assessment methods

Term paper

#### Resources

##### Ressources en bibliothèque

- [Data Centres and Data Transmission Networks - Technical report - EIA \(2020\)](#)
- [Digitalisation and Energy - Technical Report / IEA \(2017\)](#)
- [Behind and Beyond the Meter - Digitalization, Aggregation, Optimization, Monetization / Sioshansi](#)