



Education for Digitalization of Energy

Deliverable 6.4

First presentation of E-Learning platforms and pilot activities

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Abstract:

This report aims to provide a first presentation of established E-learning Platforms with relevant courses in digital energy topics and the E-learning platforms deployed in the piloting activities. Moreover, the content of each piloting activity with supporting material is presented to be published on the EDDIE website.

Keywords:

D6.4, E-learning platform, piloting activity, learning material, online course, MOOC

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Definitions, Acronyms and Abbreviations

AI	Artificial Intelligence
IoT	Internet of Things
LEGOS	Lite Emulator of Grid Operations
ML	Machine Learning
MOOC	Massive Open Online Courses
POK	Polimi Open Knowledge
VET	Vocational Education Training

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Executive Summary

Online learning and E-learning Platforms have been evolving with the progression of information and communication technologies. They are offering a new learning experience and enabling new education formats. There are different types of courses and E-learning Platforms, depending on the topic, the learner's objectives and the instructor's application of E-learning. E-learning

In this deliverable different types of E-learning Platforms have been featured. In the first part, the E-learning platforms deployed in seven of EDDIE's piloting activities are presented. On one side, there are E-learning Platforms which are used in combination with in-person teaching activities, such as the RWTH Moodle and NTUA Helios. Thanks to the latter, students have the possibility of benefiting from both interactions, online and in-person learning. On the other hand, there are E-learning Platforms with courses designed for only online experiences, such as POK and ERIGrid Moodle. In the MOOC courses on the E-learning Platform students can learn from anywhere, independent of their location as long as they have access to the internet. In the second part, the other E-learning Platforms are explored, here solely with online learning. The E-learning Platforms available online offer a large variety of established E-learning Platforms for self-structured online learning in MOOCs and courses on different topics. Relevant to the EDDIE project and to its goals are in this matter the platforms with content related to the digitalization of the energy sector. Thus, ten E-learning platforms were identified and analysed. Moreover, two exemplary relevant courses on these platforms were presented.

The roll-out of the Blueprint Strategy for the Digitalisation of Energy (BSDE) in EDDIE will take place in a central pilot site in Germany (Aachen) and in four smaller-scale pilot sites in Germany (Cologne), Greece (Athens), Italy (Milano) and Spain (Madrid). The deployment will include overall, 17 individual piloting activities, targeting different EQF levels and designed as different educational programmes. Detailed information on the content, timeframe and assessment of these activities is described in the deliverables D6.1 and D6.2. To support the dissemination of activities to a broader audience, disseminate the EDDIE topics in educational settings, give access to interested stakeholders, and also to document activities, each piloting activity will be presented in a dedicated section of the EDDIE website. Hence, in this deliverable there is a brief presentation of each piloting activity, supplemented with links for additional information, the E-learning Platform and a description of the accessible educational material. Ultimately, this content and information will be published on the EDDIE website and will be accessible to interested website visitors.

1. Introduction

Information and communication technologies offer unique educational and training opportunities, as they provide different types of E-learning approaches. In the existing and future educational setting, E-learning is playing a vital role. It gives the possibility for students to study self-paced, self-directed and independent of the location. On the other side, for educators, E-learning helps in the management and organization of educational programs.

Online E-learning platforms are an application tool for numerous E-learning methods E-learning. By supporting the dissemination of E-learning methods, these platforms are enabling new education formats. The only prerequisite to access E-learning platforms is an internet connection and a computer.

This deliverable features a description of different E-learning Platforms and the description of the individual pilot activities for the presentation on the EDDIE website. Firstly, the E-learning Platforms; RWTH Moodle, ERIGrid Moodle, POK and NTUA Helios used in their respective piloting activities are presented. Secondly, an overview of the E-learning Platforms with educational material regarding digital energy topics is given. Online available are different established E-learning Platforms with relevant educational material in the context of the EDDIE topics. This deliverable is offering information and an uncomplicated access to them. In addition, the individual piloting activities described in deliverables D6.1 and D6.2 are briefly presented in this deliverable. The latter is a brief summary depicting the available educational material of the activity and related links for additional information on said activity. In addition, the E-learning Platform used for the piloting activity will be linked, if there is a Platform used. This information will be available in a dedicated section on the EDDIE website for interested people and to support the dissemination of the field tests.

Overall, there are 17 different piloting activities in EDDIE, targeting different EQF levels and designed as different educational programs. In the main field test in Aachen, there are eight piloting activities including different workshops, a summer school, university lectures and dissemination events. One part of the activities with an EQF level of 1-3 is focusing on the younger generation, as well as on the broader audience to raise awareness and educate on the digitalization of the energy grid. The other part of the activities in Aachen include different lectures and a summer school at RWTH about modern power systems and digitalization. Lastly, in partnership with other stakeholders there will be a workshop, based on smart city initiatives, in order to achieve dissemination of EDDIE to a wider audience, focusing on energy applications.

In coordination with the Aachen pilot site and in the context of the BSDE directions, four other pilot sites will be developed in Cologne, Athens, Milan and Madrid. The Cologne pilot site will be mainly industry driven, aiming to reduce skills gaps in the energy sector. This includes a program to train employees on new trends in the energy sector, a certificate program for mastering the energy landscape of the future, and a course connecting companies as teaching entities with students. The Greek pilot site focuses on lectures and courses to university students in the field of new tools and mechanisms that will play a crucial role in the digitalisation of the energy system. To raise synergies, NTUA also plans to participate in a summer school and a MOOC, organized by the H2020 project ERIGrid 2.0, aiming to stress the necessity of the update of education programs, in the context of the transformation of the energy sector. In Italy, Politecnico di Milano will develop a MOOC targeted to digital energy management for real estates, aiming to match green skills with the real estate sector. Finally, Piquer is setting up a complementary training module on automation technology to improve the energy efficiency and control the energy consumption in private households as an educational offer in vocational training (VET) in Spain.

1.1. Structure of the Document

The deliverable is split into two main parts. The first part contains the description of the E-learning Platforms used in the piloting activities and other relevant E-learning Platforms, with material in the context of the EDDIE project. In the second part of the document, the description of the piloting activities and the related material for the EDDIE website are presented.

1.2. Overview of piloting activities with E-learning platforms

One part of the piloting activities will use an E-learning platform for the deployment and support of the activity. In Table 1-1 these activities are listed.

Table 1-1: Overview of piloting activities with an E-learning Platform

Site	Partner	Activity	EQF Level	E-learning Platform
Aachen, Germany	RWTH	Summer School on smart electrical power systems	6	RWTH Moodle
Aachen, Germany	RWTH	Leonardo lecture on energy transition	6/7	RWTH Moodle
Cologne, Germany	EWI	Certificate in Future Energy Business	6	t.b.d.
Athens, Greece	NTUA	Lectures on Local energy markets, energy communities and Blockchain applications	7	NTUA Helios
Athens, Greece	NTUA	Lectures on Artificial Intelligence applications on energy systems: Dynamic security and forecasting	7	NTUA Helios
Athens, Greece	NTUA	Introductory lecture into MOOC on advanced validation methods for smart grids	6,7	ERIGrid Moodle
Milan, Italy	POLIMI	MOOC "Energy management for real estates"	5	POK

2. Description of E-learning Platforms

2.1. E-learning Platforms deployed in pilot activities

For the deployment of seven piloting activities, the E-learning Platforms POK, Moodle (RWTH Moodle and ERIGrid Moodle) and NTUA Helios are used (see Table 1). Overall these platforms give the possibility to students and instructors to use different types of teaching and learning materials. The POK and ERIGrid Moodle Platforms are used only for an online learning experience, for students with Massive Open Online Courses (MOOCs), whereas the RWTH Moodle and NTUA Helios Platform are employed in combination with in-person teaching at the universities, to facilitate, support and compliment the courses.

2.1.1. POK

Polimi Open Knowledge - POK (<http://www.pok.polimi.it>) is the open knowledge platform of Politecnico di Milano (Polimi), launched in 2014 for the MOOCs delivery. It is based on OpenEdx, an open source learning management system (LMS) developed by MIT and Harvard University to host MOOCs. The number of MOOCs and of participants enrolled in POK have steadily grown since its birth. At the time of writing of this deliverable, almost 150,000 enrolled learners can count on 100 MOOCs, provided in Italian or in English (and in some cases in both languages), with up to 2,000 videos and a wide range of educational contents and learning activities.

Even from the early stages of the platform design, the main goal outlined was to integrate the on-campus learning and teaching experience covering the gaps highlighted from the analysis of a specific identified target: the students. Three kinds of responses were identified: the support of future engineering students with basic “hard skills” related to math and physics, the skills alignment of students from other universities enrolling in Polimi, the development of soft skills for new graduates entering the job market. Figure 2-1 shows the welcome page of the POK.

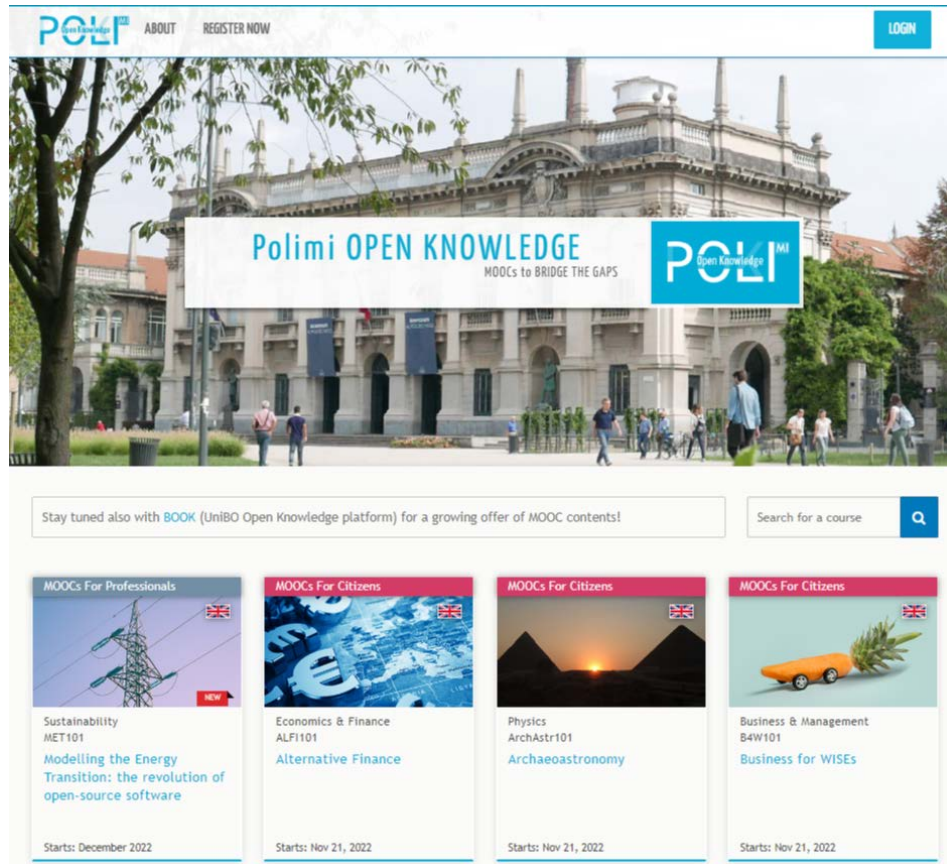


Figure 2-1 Welcome page of POK

In the last period, MOOCs delivered on POK have been specifically designed to support teaching and learning innovation, blended learning processes or, specifically, flipped classroom approaches. There are currently more than 150 courses in Polimi that have officially integrated MOOCs, either developed ad hoc for their own courses or using existing ones.

Based on the main target addressed by the course, the MOOCs are organized under collections:

- MOOCs for students, to improve their knowledge background and their skill set before and during their Bachelor's and Master's degree courses;
- MOOCs for researchers, to help them develop transversal skills, needed for their work;
- MOOCs for professionals, to develop specific technical, hard skills in innovative professional areas and soft skills required by the job market;
- MOOCs for teachers, to support teaching and learning innovation in both Higher Education Institutions and schools;
- MOOCs for citizens, to explore global challenges and citizenship issues and provide opportunities for lifelong learning not strictly related to career enhancement.

Contents inside MOOC are organized in weeks that represent the macro-topics of the course, modules and lessons that can be formed by more elements (e.g. an introductory text, a video and a list of resources).

The MOOC “Energy management for real estates - Fundamentals, methods and digital tools” developed in the frame of Italian pilot will be published on this platform and will be accessible by everyone for free with the possibility to attend at own pace.

2.1.2. Moodle

Moodle is a free and open-source learning management system used by a huge number of institutions and organisations around the world. It is highly customizable and provides great flexibility in terms of configuration of content and available tools. In this way individual institutions can build and manage their own E-learning Platform with the Moodle system.

ERIGrid Moodle

In the frame of ERIGrid 2.0 a MOOC hosted by Moodle is being developed which will act as a learning program on using advanced laboratory testing methods for the validation of electrical and multi-energy systems targeting students, researchers, and professionals. For the successful experimentation, apart from the validation techniques, the effective design and documentation of complex test systems holds an equally important role, thus in the frame of ERIGrid projects, a Holistic Test Description (HTD) method was developed, and a dedicated course is being designed to complete the view and cover the testing in a holistic manner. For the recording of presentations, Loom platform will be utilized, as a high quality, easy-to-use recording tool. It is also free of charge for institutions holding educational licenses. The presenters will record videos and upload them in ERIGrid 2.0 YouTube channel and link them to the Moodle platform. Regarding the registration procedure, potential attendees of the ERIGrid 2.0 MOOC will be able to register to the course for free through one single access point from the project's website. Moreover, a forum will be setup, where the attendees will have the chance to ask questions. Finally, after the completion of the course a certificate of attendance will be awarded and feedback from the participants will be requested.

RWTH Moodle

RWTH Aachen University uses Moodle as a central web based teaching and learning platform. Virtual learning rooms offer a wide range of functions for the implementation of digital teaching formats. Thanks to a wide range of plug-ins from the Moodle open source community, the platform can be flexibly expanded. The learning spaces are access-controlled. Apart from the persons holding or supervising the associated course, only students admitted to a course have access to a learning space. However, external people can be granted access for a specific Moodle course by the Partner Manager of the RWTH IT Help Centre. Annual surveys among users of the Moodle learning platform show a high level of satisfaction. The welcome page of RWTH Moodle is shown in Figure 2-2.

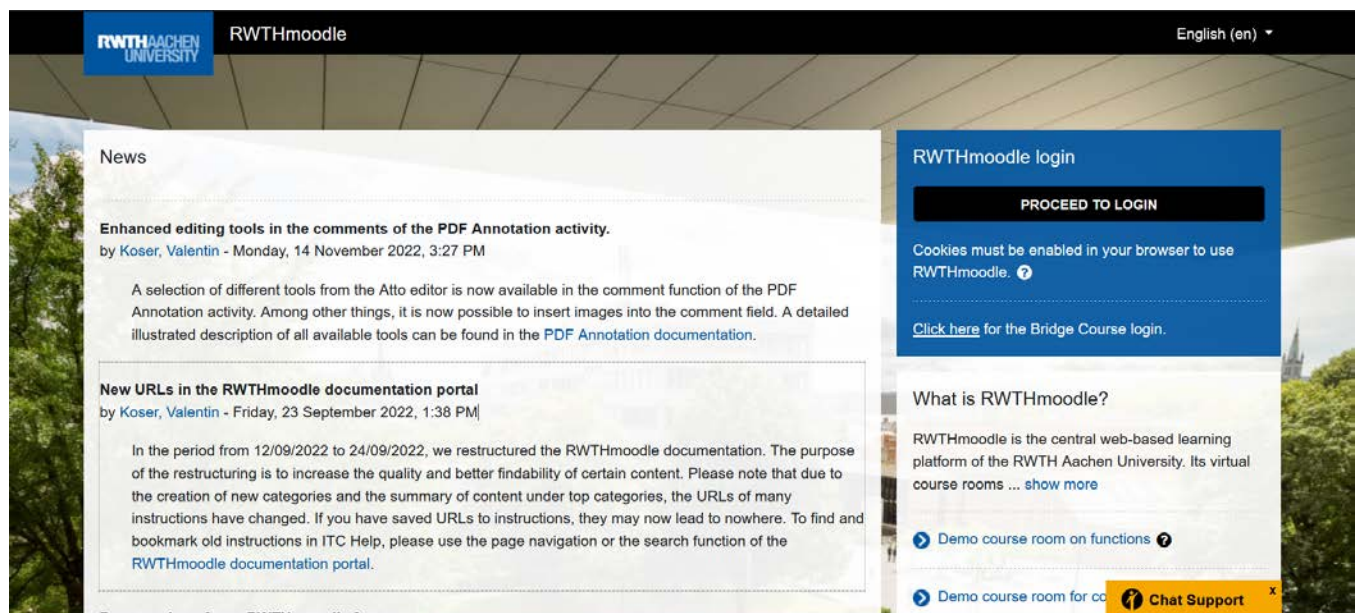


Figure 2-2 Welcome page of RWTH Moodle

2.1.3. NTUA Helios Platform

In 2021 the new Helios course management platform of NTUA was launched where students can find material for all the University's courses. The lecturers post their individual announcements and how courses are organized on Helios, which are then available for the enrolled students. The platforms welcome page can be seen in Figure 2-3.

The platform is a service based on Moodle and covers all the NTUA courses. More specifically the Helios platform integrates courses and seminars for all NTUA schools and services provided. The overall structure of the platform is listed below:

- Start Guides
- Previous Academic Years
- School of Civil Engineering
- School of Mechanical Engineering
- School of Electrical and Computer Engineering
- School of Architecture
- School of Chemical Engineering
- School of Rural, Surveying and Geoinformatics Engineering
- School of Mining & Metallurgical Engineering
- School of Naval Architecture & Marine Engineering
- School of Applied Mathematical & Physical Sciences
- Centre of Education and Lifelong Learning of NTUA (KEDIVIM)
- Seminars

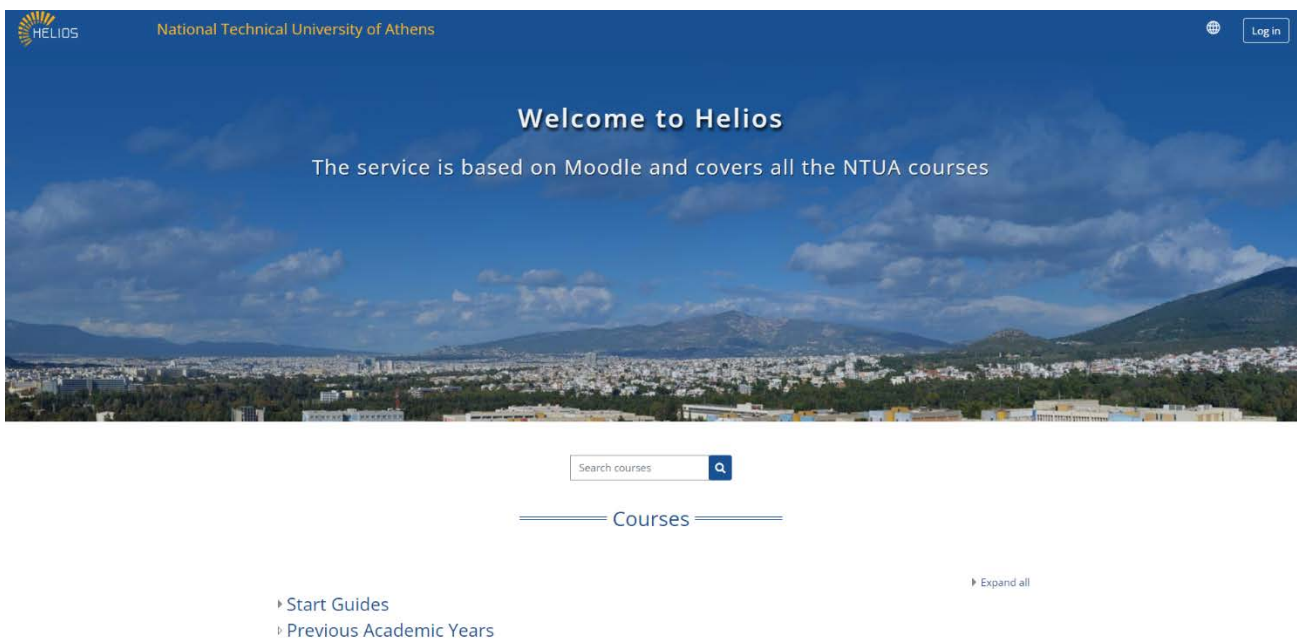


Figure 2-3 Welcome page of NTUA Helios

2.2. Other relevant E-learning Platforms

During the progression into the digital age, online learning and E-learning platforms have seen advancements in offering a complete learning experience and have greatly increased in popularity. An E-learning platform is a web space for educational content and resources that allows students to access and enrol in a variety of courses in a strictly digital way. It offers a user-facing environment where students can learn new skills, and also offers flexibility with regards to content formats (e-books, articles, presentations, video etc.). It usually also includes content modules, learning modules, and evaluation modules.

Depending on the industry and also the learner's objectives, there are many E-learning platforms to choose from with respect to the structure, the course content, format and the price. Thus, in this section, the consortium presents

a set of E-learning platforms that have content related to the digitalization of the energy sector, as well as some specific courses that can be found on these platforms. In the examples stated below, apart from the digitalization in energy there are also many courses that can be found in fields that are directly linked and essential for the energy transformation, such as:

- Artificial Intelligence and Machine Learning
- Cybersecurity
- Internet of things
- Robotics
- Big Data/Data Analysis
- Blockchain
- Augmented reality
- Industrial automation
- Simulation and optimization
- Cloud services

2.2.1. Coursera

General presentation of the platform

[Coursera](https://www.coursera.org) was founded in 2012 and is a global online learning platform that offers anyone, anywhere, access to online courses and degrees from leading universities and companies. Figure 2-4 shows the welcome page. With more than 113 million students around the world and more than 275 partnering universities and companies, Coursera offers a range of learning opportunities. More specifically, it offers guided projects, individual courses, specialized courses, and degree programs that support on-demand video lectures, homework exercises, peer-reviewed assignments, and community discussion forums. As for the pricing, while there are many courses that are completely free and have free trials, in some cases there is an affordable price depending on the format of the training.

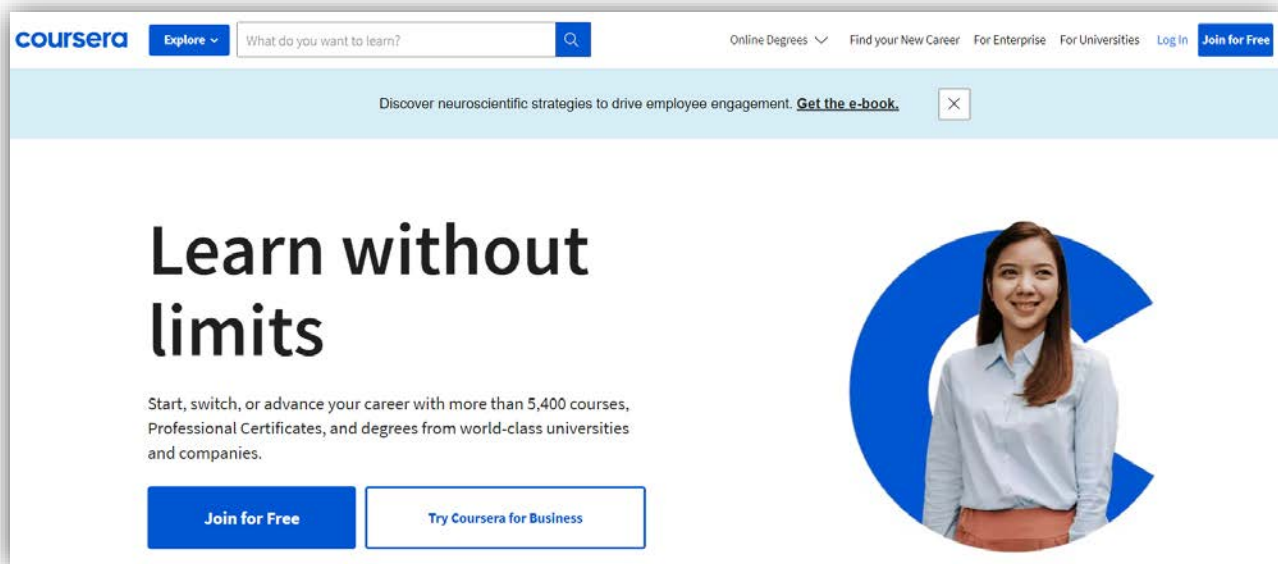


Figure 2-4 Welcome page of Coursera

Importance

What makes Coursera successful is the offer of online education from leading universities in an affordable price range. Overall, it has made more than 1,500 courses available completely for free and in many languages. As for the degrees and certificates offered, these are recognized by a multitude of employers and on top of that, multiple learning options and activities are available, as well as high-quality educational tools and instructor interactions.

Courses with relevant content

1. Real-Time Embedded Systems

The Real-Time Embedded Systems specialization is a series of four courses aiming to take one from a beginning practitioner to a more advanced real-time system analyst and designer. The aim is to gain experience on topics such as predictable response services, when to allocate requirements to hardware or software, as well as mission critical design. This knowledge is invaluable for medical, aerospace, transportation, energy, digital entertainment, telecommunications, and other embedded career options.

Contents:

- Rate Monotonic theory and policies
- Methods of Rate Monotonic analysis
- Real-time system design techniques
- Engineering principles for allocating functionality and services to hardware, firmware or software implementation

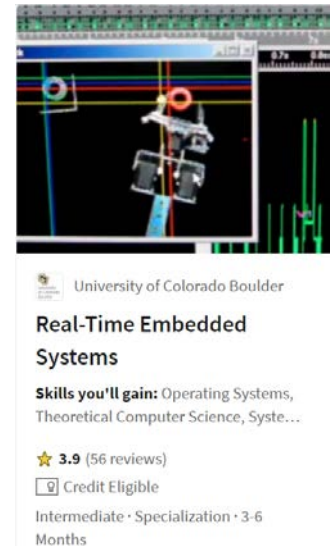


Figure 2-5 Real-Time Embedded Systems - Course overview

2. Big Data Modelling and Management Systems

This course aims to provide knowledge in various data genres and management tools as well as to teach the reasons behind the evolving plethora of new big-data platforms from the perspective of big data management systems and analytical tools. Through guided hands-on tutorials, the students will become familiar with techniques using real-time and semi-structured data examples. Systems and tools discussed include: AsterixDB, HP Vertica, Impala, Neo4j, Redis, SparkSQL. This course provides techniques to extract value from existing untapped data sources and discovering new data sources.



Figure 2-6 Big Data Modelling and Management Systems - Course overview

2.2.2. EdX

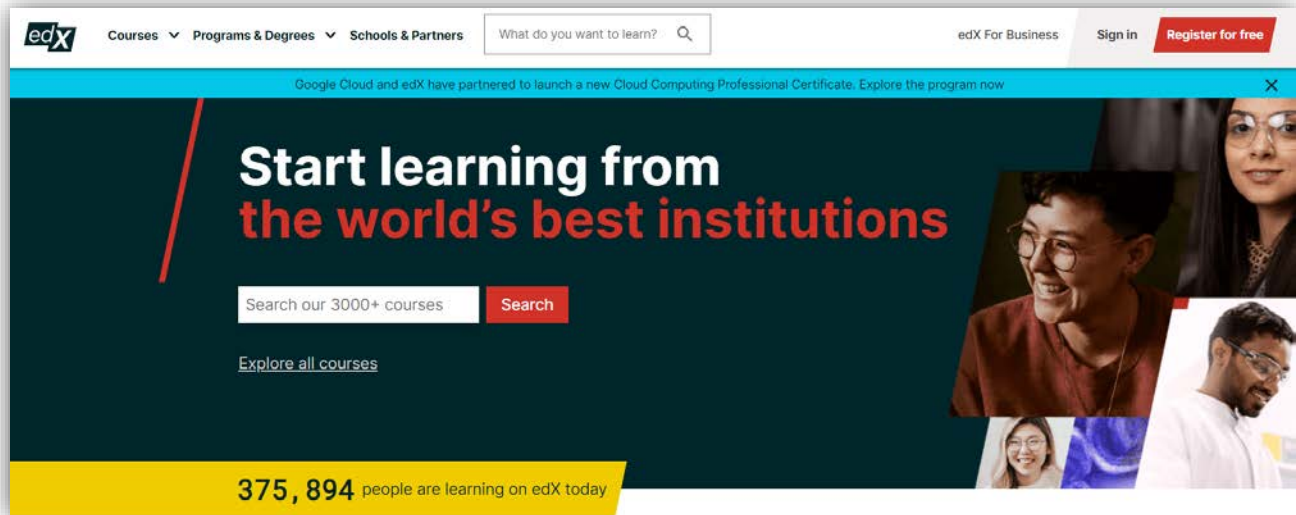


Figure 2-7 Welcome page of EdX

General presentation of the platform

EdX was first launched in 2012 by Harvard University and MIT and is now one of the most known E-learning platforms, where students can find online courses from more than 160 partners. Figure 2-7 presents the welcome page of EdX. Most courses tend to skew into the STEM fields, such as data analysis, engineering, math, and with more than 3600 courses and 110 million enrolments. EdX has increased access to high-quality education for everyone, everywhere.

Importance

EdX has a very diverse library of courses suitable for most ages looking to learn a subject, new skills, or to earn a bachelor's or a master's degree. Thus, it is really important that it offers a great number of courses for free that are open-source. Another factor to its success is that it has designed interactive online classes which allows students to participate and learn through an innovative way.

Courses with relevant content

1. Enabling Technologies for Data Science and Analytics: The Internet of Things

This data science course teaches the key component of the IoT and how data is collected by sensors. Also, the course will explore ways to analyse event data, sentiment analysis, facial recognition software and how to use data from devices for decision making. The course overview is shown in Figure 2-8.



Figure 2-8 Enabling Technologies for Data Science and Analytics: The Internet of Things - Course overview

2. Introduction to Blockchain

As the first step in IBM's Blockchain Essentials Professional Certificate curriculum, this course will guide students through the basics of Blockchain technology and covers the technical and functional components required to construct any Blockchain solution using state-of-the-art tools and practices. In this course, you will learn how to design smart contracts, bitcoin wallets, transactions, fabriccode, chain SDKs, and more.



Figure 2-9 Introduction to Blockchain - Course overview

2.2.3. Udemy

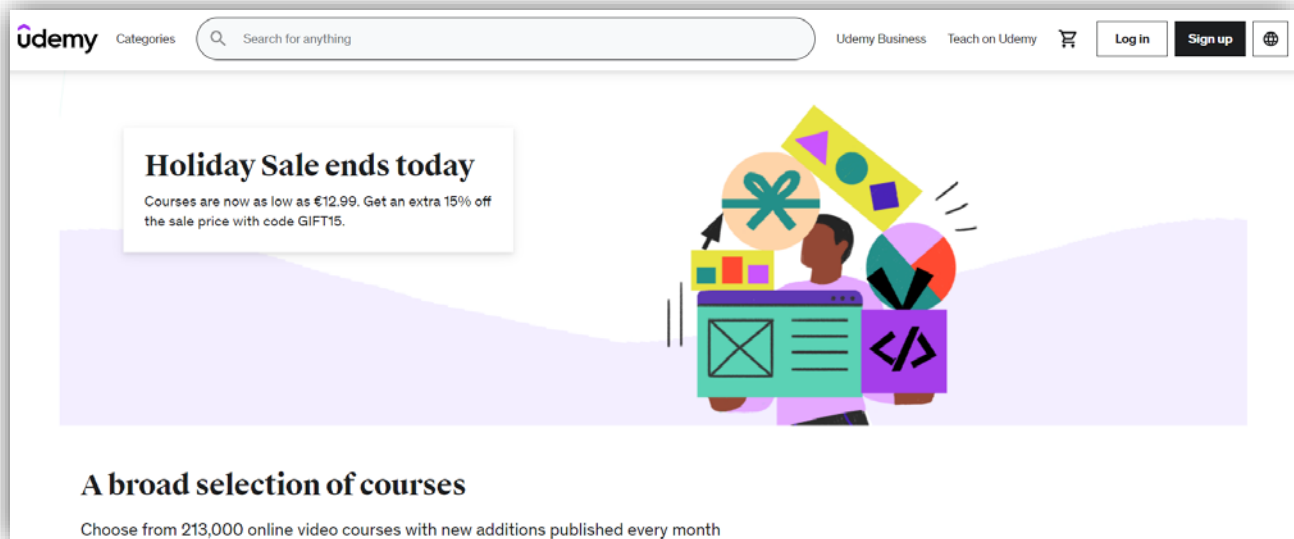


Figure 2-10 Welcome page of Udemy

General presentation of the platform

[Udemy](https://www.udemy.com/), has more than 213,000 online courses covering a wide variety of fields and 57 million learners. There's no dominant field on Udemy and thus students can learn a variety of thing ranging from digital skills to personal development. Most classes also use multimedia technologies which encapsulates mixing video, images, text, quizzes, etc., while has also making use of many content creation tools such as PDF documents, Microsoft PowerPoint, text, and video content etc. Lastly, with regards to price, each online course is individually priced and can range from as little as €10 going up to €200. The home screen of Udemy is again shown in Figure 2-10.

Importance

What has made Udemy so successful is undoubtedly the large selection of courses, and the 30-day money-back guarantee, as well as the fact that it is open to all students no matter their background. Overall, Udemy has a course for almost every discipline, and it is great for teachers, instructors, educators, and freelancers who are just starting out.

Courses with relevant content

1. Power Electronics: Control and Simulation of PWM Inverters

Nowadays, "Power Electronics," deals with conversion and control of electrical power, using electronic converters based on semiconductors power switches. With this course, one can learn how to control, model and simulate Three Phase Voltage Source inverters. Contents:

- Control a Three-phase Voltage Source Inverter
- Power Electronics
- Current Control of a Three-phase Voltage Source Inverter
- Voltage Control of a Three-phase Voltage Source Inverter
- Active and Reactive Power Control of a Three-phase Voltage Source Inverter
- Microcontroller implementation of Inverter Control
- Simulation of Three Phase Inverters in Simulink
- Electrical systems



Power Electronics: Control and Simulation of PWM Inverters

Learn how to control, **model** and simulate with Simulink the main type of Power Converter used in **energy** and transport

Manuel Gómez

4.1 ★★★★★ (125)

3 total hours · 35 lectures · Intermediate

Figure 2-11 Power Electronics: Control and Simulation of PWM Inverters - Course overview

2. Digital Transformation 2022 – Masterclass

Through these Masterclasses one can learn insights and knowledge that top digital transformation consultants use to create successful digital transformations. Contents:

- understanding digital transformation
- what makes digital transformations successful
- the digital transformation framework
- digital transformation technologies
- design thinking
- digital transformation future trends
- digital transformation career opportunities
- successful case studies and interviews with technology and business leaders in digital transformation



Digital Transformation 2022 - Masterclass

A complete course on **digital transformation** for 2022 - 7+ hours of videos, assignments, cases studies, and interviews.

Rian Chapman

4.6 ★★★★★ (2,333)

8.5 total hours · 62 lectures · All Levels

Bestseller

Figure 2-12 Digital Transformation 2022 – Masterclass - Course overview

2.2.4. LinkedIn Learning

General presentation of the platform

Started as Lynda.com back in 1995, [LinkedIn Learning](#) features over 17,000 courses on topics across business, technology and creativity. Overall, it is great at teaching students how to use complex software, often broken down to the simplest actions. As for the pricing, you can buy courses individually or get a recurring subscription, while all certificates can be automatically displayed on your LinkedIn profile.

Individual courses vary between €20 and €50, a monthly subscription costs €39.33, while a yearly subscription would be €29.49 a month. It is mostly suited for professionals and businesses looking to train their employees, but apart from individual learners, business teams, universities, and government organizations can use the platform for educational and training purposes.

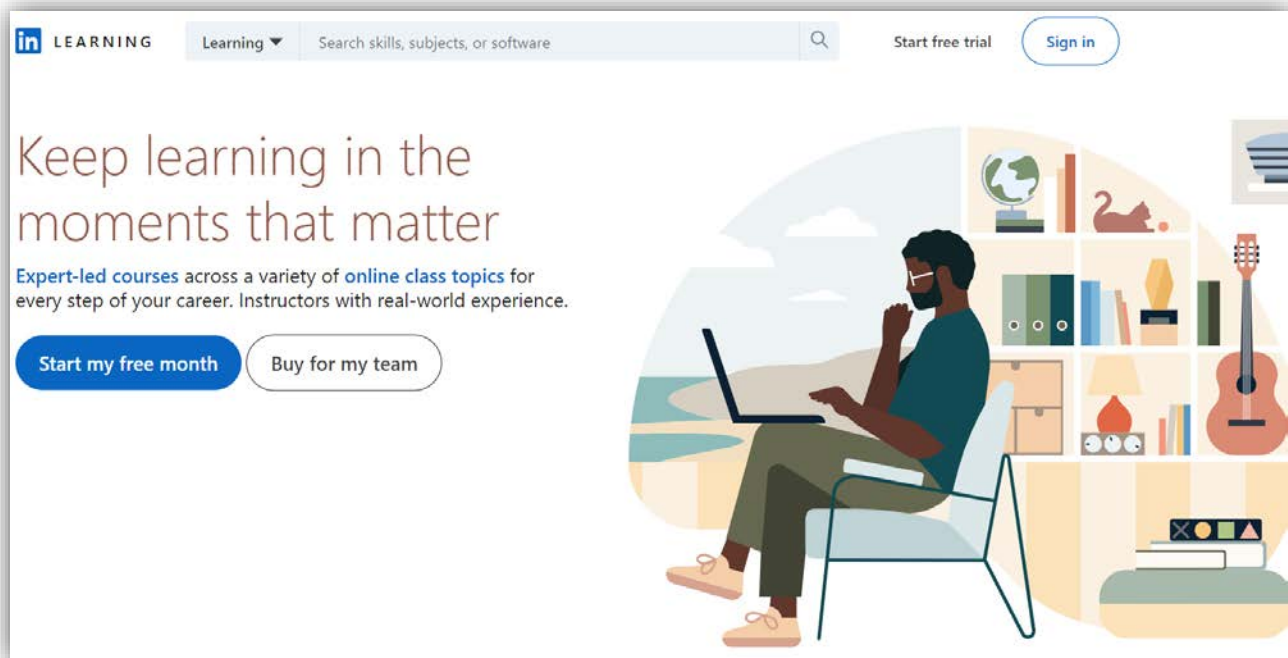


Figure 2-13 Welcome page of LinkedIn Learning

Importance

Apart from the great variety of the available courses, LinkedIn Learning is highly recognizable and valued in the Business to business (B2B) community and it also offers a one-month free trial. Based on your LinkedIn profile, it provides personalized course recommendations for users, while it offers certification upon course completion. One last parameter that makes LinkedIn Learning unique is that it has offline learning access, and regular quizzes so that students can assess and track our progress.

Courses with relevant content

1. Advance Your Skills in Predictive Analytics

Predictive analytics is one of the richest disciplines within the realm of data science. As the tools and techniques for using data to predict future outcomes have evolved, business and data analysis professionals can use this learning path to stay up to date with the latest advancements.

- Discover how machine learning (ML) is changing predictive analytics.
- Apply predictive analytics techniques for financial forecasting.
- Explore the predictive analytics functions of R, Python, etc.



LEARNING PATH

Advance Your Skills in Predictive Analytics

17h 23m

Figure 2-14 Advance Your Skills in Predictive Analytics - Course overview

2. Become a PLC Developer

Programmable logic controllers (PLCs) control devices in heavy-duty situations. But PLC logic doesn't look like typical software code, instead using approaches that fit automation scenarios. Learn how PLCs can help you create complex interactions and sequences to solve problems beyond the computer.

- Learn how PLCs bridge software and hardware.
- Create basic PLC logic you can apply across devices.
- Sequence multiple actions with PLCs for repetitive tasks.



LEARNING PATH

Become a PLC Developer

7h 12m

Figure 2-15 Become a PLC Developer - Course overview

2.2.5. IEEE – Academy

General presentation of the platform

[IEEE](#) is a leader in engineering and technology education, providing resources for pre-university, university, and continuing professional education. IEEE offers innovative STEM and university education and recognition programs for students and their teachers, facilitates the accreditation of engineering programs at the university level, and offers ongoing continuing professional education for practitioners and engineering faculty through platforms such as the IEEE Learning Network (ILN). The ILN is the online website for discovering continuing education from across IEEE. With hundreds of educational courses available, ILN offers the latest in continuing education in engineering, technology, and more. Topics covered include 5G, Smart Grid, Renewable Energy, the Internet of Things (IoT), English for Technical Professionals, and more.

Another E-learning platform from IEEE, is the IEEE Academies that were initiated in 2020 on Lifelong Learning and Continuing Education. The IEEE Academies are designed to teach on-demand technical concepts in a new way to IEEE members working in the industry. IEEE Academies have been developed primarily for members who work in the industry and need to understand new technical trends quickly so they can apply them to their work.

The current IEEE Academies, are IEEE Academy on IoT, IEEE Academy on Smart Grid, IEEE Academy on Artificial Intelligence (AI).

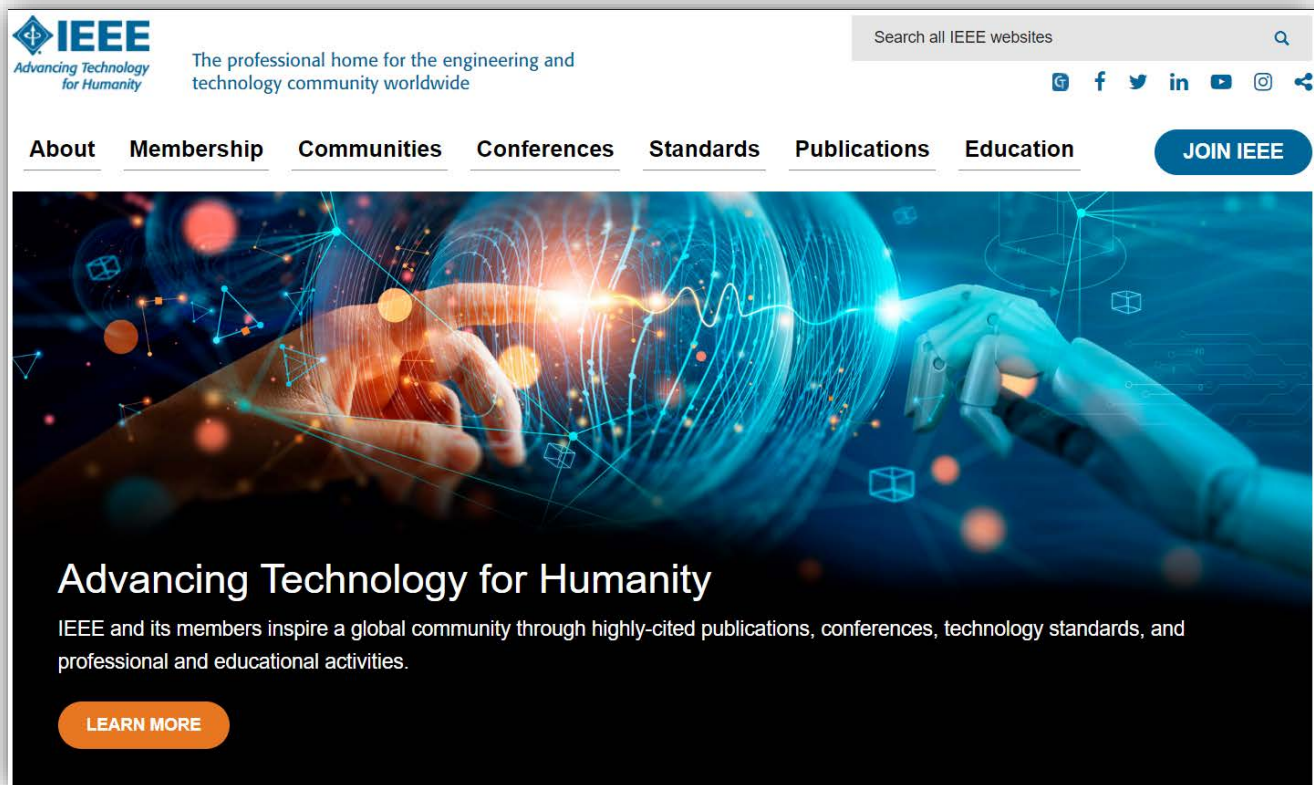


Figure 2-16 Welcome page of IEEE

Importance

The IEEE Academies are a new learning format at IEEE that aim to help members understand a technical concept without needing a deep background in a particular technology. Concepts are presented in a simple and easy-to-understand manner and don't require a deep prerequisite knowledge of the subject. It is also important that at the completion of an IEEE Academy, the learner will be able to demonstrate a new understanding and earn a certificate recognizing the new knowledge.

Courses with relevant content

1. Distribution Automation

Distribution Automation (DA) is the foundation upon which the Smart Grid is built. This learning path will cover the fundamentals of the existing power distribution system, starting with a general overview, and will include explanation on the equipment, components, devices, applications, and functionalities of the power grid. In addition, Power Distribution System processes like planning, design, operation, and maintenance—will be covered. The next step will discuss automating the distribution system. This includes system architecture, layers, objectives, functions of distribution substation and feeder automation. The course will further proceed to the advanced functionalities of DA, including the role of Distribution Management System (DMS) in Smart Grid.



Distribution Automation



Figure 2-17 IEEE Academies

2. Internet of Things

IoT computing platforms are essential to the development and deployment of IoT applications. Being naturally distributed, such applications have very challenging and diverse requirements. The learning path covers all these aspects by providing an overview of the current state-of-art and future trends on computing platforms for IoT applications.



Figure 2-18 IEEE Academies

2.2.6. TU Delft Online Learning

General presentation of the platform

TU Delft is one of the top education and research centres at the heart of the oldest and largest technical university in the Netherlands. In 2014 it created an E-learning platform with courses that are developed by the academic staff at TU Delft. [TU Delft's online learning](#) has more than 3.5 million online learners and 125 MOOCs, and is predominantly asynchronous, but some courses may occasionally have live sessions at a specific time and date. Overall, TU Delft online learning is open to all interested in the fields of science, design and engineering, while the courses include simulations, interactive exercises, online experiments and collaborative group projects, but also several assignments and quizzes which are essential in order to earn the course certificate.



Figure 2-19 Welcome page of TU Delft Online Learning

Importance

What makes TU Delft Online Learning so successful is that it has been established by academic staff with a focus in applying theoretical knowledge to practical solutions and being innovative, and it is really flexible offering course work & interactions strictly online so that students can study anytime, anywhere.

Courses with relevant content

1. Intelligent and Integrated Energy Systems

The energy systems and the power grids of the world are undergoing a rapid transition. The advancements in computational tools have resulted in levels of efficiency, security, and reliability never seen before in the energy industry.

This series of MOOCs provides unique and multi-disciplinary insights on how to understand, design, plan and operate the intelligent and integrated energy systems in the rapidly evolving energy sector. The program focuses on four main aspects: technology, digitalization, policy and governance, and innovations for sustainable business, thereby providing the learner with a holistic view of the revolution in energy systems and power grids. Objectives:

- describe the complexities of energy systems and power grids, and the requirements and industrial impacts of integration, automation and optimization
- explain the technologies driving the change and provide practical hands-on experience in the use of advanced numerical and computational tools
- provide an in-depth analysis on the economic and societal impacts of changes in energy systems and the design of new interventions best suited for energy systems of the future
- discuss new market potentials for business models employing and utilizing the changes to the energy systems and power grids as opportunities.



Intelligent and Integrated Energy Systems

 Starts Anytime

Figure 2-20 Intelligent and Integrated Energy System - Course overview

2. PV Modelling, Simulation and Analysis

This Professional Certificate Program in PV Modelling, Simulation and Analysis consists of two career-oriented courses. It is a highly practical program, which will provide you with the appropriate tools and valuable knowhow of how to characterize and predict the performance of photovoltaic technologies – from small solar cells to large power systems. Throughout the program, you will work on various scenarios and case studies, based on real-life problems.

Contents:

- How to improve the design of PV devices and systems.
- How to analyse manufacturing and installation trends to enhance the performance of devices and systems.
- To master and manipulate the processes of the entire PV value chain, from device manufacturing to system operation.



PV Modeling, Simulation and Analysis

 Starts Anytime (Self-Paced)

Figure 2-21 PV Modelling, Simulation and Analysis - Course overview

2.2.7. DNV Online Training

General presentation of the platform

[DNV](#) is a recognized advisor and delivers world-renowned testing, certification and technical advisory services to the energy value chain including renewables, oil and gas, and energy management. It is one of the world's leading certification bodies, helping businesses assure the performance of their organizations, products, people, facilities and supply chains. DNV has, thus, created online courses for professionals that can be trained in specific fields with a practical and on-the-job focus.

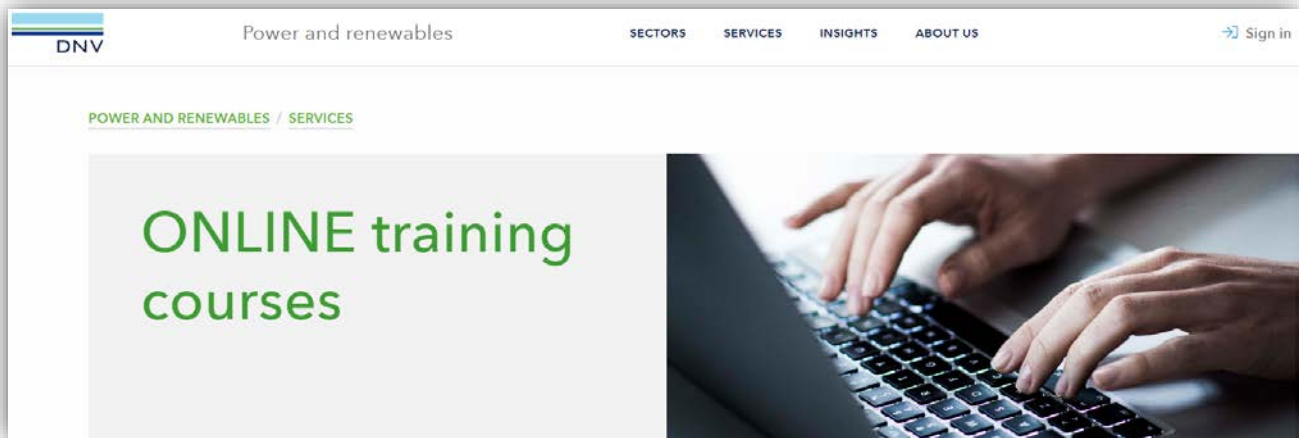


Figure 2-22 Welcome page of DNV Online Training

Importance

The trainings have been created by professionals and advisors that are experienced in the field of digitalization and the energy sector, and thus it is focused on developing practical skills and delivering focused training to the participants.

Courses with relevant content

1. CIM training course

Grid Digitalization can be seen as enhancing and augmenting the conventional electricity grid data with the integration of information and communication technologies using operational technologies such as SCADA (Supervisory Control and Data Acquisition), EMS (Energy Management System), DMS (Distribution Management System), GIS (Geographical Information System), AMR (Automated Meter Reading) and ERP (Enterprise Resource Planning). This course will provide you with an understanding of how the Common Information Model (CIM) supports digitalization to reduce cost in operations, planning and asset management and give you an overview of the standards that define CIM and its fundamental processes.



Figure 2-23 CIM training course - Course overview

2. DLMS/COSEM training course

Correct exchange of meter data is of major importance in the liberalized energy market. Remote energy meter interrogation is essential or the fast and reliable determination of balance or unbalance between forecasts and actual energy usage in a fast and reliable way remote interrogation of energy meters is unavoidable. The data collection protocol DLMS/COSEM is an international standard that is ideal for this purpose. This course will provide you with the knowledge you need regarding the capabilities and benefits of DLMS/COSEM communication and regarding recent developments in this field.



Figure 2-24 DLMS/COSEM training course - Course overview

2.2.8. Stanford Online

General presentation of the platform

[Stanford Online](#) is Stanford University's E-learning platform with free and open content developed by Stanford faculty across the university, providing a variety of ways to learn. These include accredited academic degrees and professional certificates of achievement, as well as open access to individual classes, lectures, and other materials created by Stanford's faculty. Open learning opportunities are available through Stanford Online, which offers more than 100 massively open online courses, or MOOCs such as:

- *Courses for Academic Credit*

These courses grant Stanford University credit, affirmed in an official university transcript and culminating in a Stanford University degree.

- *Courses to Earn Certificates*

These courses, or sequences of courses, grant ID-verified certificates of completion and are offered at three levels:

- *Professional Certificate*

such as Certificate of Achievement, Certificate of Completion etc.

- *Open learning opportunities*

These courses are typically free and open to all, while students who successfully complete courses that include graded assignments may also receive a certificate of participation.



Figure 2-25 Welcome page of Stanford Online

Importance

One of the factors that makes Stanford Online so successful is that courses are developed by experienced academics and researchers, coupled with the fact that it works closely with Stanford schools, departments, programs, and centres to design and deliver engaging, high-quality online, in-person, and blended learning experiences to both matriculated students and a global audience of learners.

Courses with relevant content

1. Transforming the Grid: AI, Renewables, Storage, EVs, and Prosumers

The electric grid is undergoing a dramatic change. The rapidly decreasing cost of power electronics, communications and sensing are enabling widespread deployment of novel measurement and control devices. In this course, you will learn about the modern electric grid and focus on transforming technologies including AI, ML, storage technologies, and electric vehicles. Objectives:

- Describe how electricity is generated, transmitted, and distributed
- Identify AI and ML applications
- Understand the digital transformation of the grid
- Calculate pricing and rate models for storage and renewable scenarios
- Interpret the emergence of electric vehicle (EV) charging demand
- Explain the advantage of using different storage technologies



Figure 2-26 Transforming the Grid: AI, Renewables, Storage, EVs, and Prosumers - Course overview

2. Energy Innovation and Emerging Technologies Program

The Energy Innovation and Emerging Technologies Program examines emerging technologies, policies, economics, and management practices that will transform how we obtain, distribute, store, and use energy. Self-paced, online energy courses will give you the insights and skills needed to successfully address problems related to energy and sustainability. Objectives:

- Get a clear picture of the entire energy landscape
- Understand the fundamentals of how each technology works
- Identify opportunities to contribute to each technology's development and marketing
- Learn how to make wise investments in energy companies

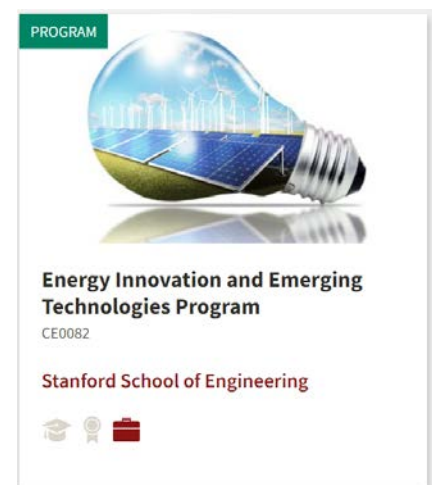


Figure 2-27 Energy Innovation and Emerging Technologies Program - Course overview

2.2.9. Future Learn

General presentation of the platform

[Future Learn](#) is an online education platform that offers hundreds of courses from the world's leading universities. Most courses can be audited for free, but access to course tests and a Statement of Participation or Certificate of Achievement becomes available only if one upgrades to a paid course. There is also an option of purchasing an unlimited subscription for about €250 per year, which includes access to over 600 short courses.

Most courses include video and audio content, reading materials, and short quizzes. All students can post their questions and discuss topics with teachers and each other, while some courses also offer assignments. In addition to free courses, Future Learn offers Premium courses for a fee. While most of its courses are offered with an option to enrol for free, Premium courses are offered only with a fee and are perfect for people who prefer to learn in a small group setting and who want to advance their careers. They are divided into several categories: IT and Digital Skills, Business and Management, Teaching, and Healthcare. Overall, Future Learn offers 21 Micro credentials that are fully accredited and require 100-150 hours of study over 10-12 weeks.

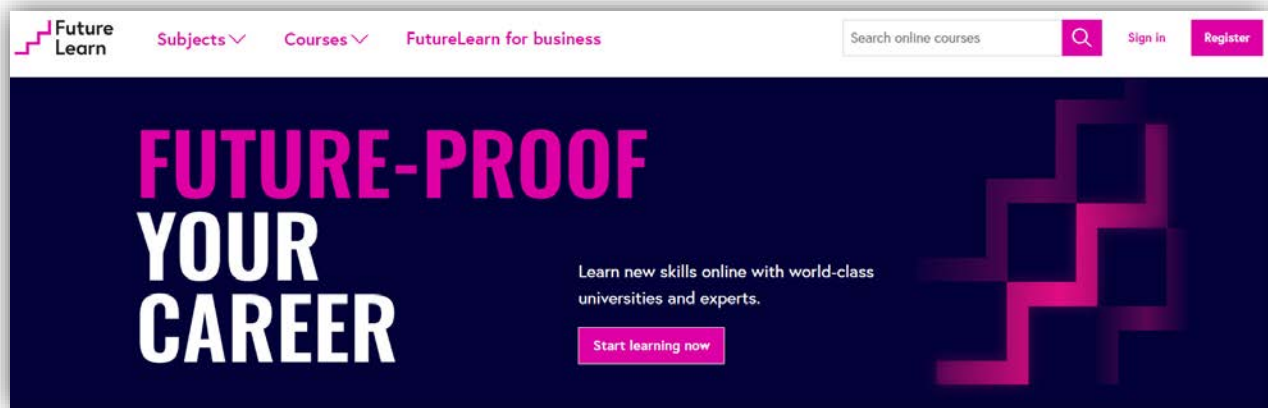


Figure 2-28 Welcome page of Future Learn

Importance

What is important about Future Learn is that it provides more than 800 courses focusing in IT and Digital Skills, the majority of which can be viewed for free.

Courses with relevant content

1. Battery Storage: Understanding the Battery Revolution

Change is happening fast in the field of energy storage. As our technology develops, the need for effective ways to store energy is evident. With this course, one can learn how advancements in battery technologies can help address these needs. The benefits of using battery energy storage for industrial products and as well as understanding batteries and how they're used today will be examined and the future of what energy storage might look like will be explored.

Content:

- The importance of energy storage
- Large scale battery production
- Energy storage application: industrial products
- Energy storage application: Electric Vehicles

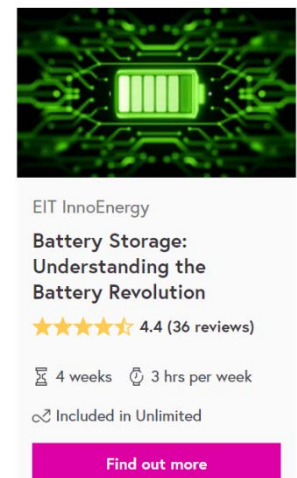


Figure 2-29 Battery Storage: Understanding the Battery Revolution - Course overview

2. Energy Systems Integration: An Introduction

With the rising cost of energy and the threat of climate change on energy security, the world is facing critical energy challenges. On this course, one will explore sustainable energy solutions, and build skills to develop, plan and operate an integrated sustainable energy system.

One will learn how energy systems interact and how to relate your energy expertise to the wider framework of energy transition. One will look at the integration and regulation of energy systems as well as the impact of electro mobility, the future of electric power systems, and the psychology of consumer behaviour.

Content:

- Introduction to energy system integration
- Coupling of energy vectors
- Coupling across geographical scales
- Coupling of regulation and control mechanisms
- Coupling of other infrastructures
- The integrated energy system: putting it all together



EIT InnoEnergy

Energy Systems Integration: An Introduction

★★★★☆ 3.7 (15 reviews)

⌚ 4 weeks 🕒 2 hrs per week

🔗 Included in Unlimited

[Find out more](#)

Figure 2-30 Energy Systems Integration: An Introduction - Course overview

2.2.10. IIEC Online Certification Courses

General presentation of the platform

IIEC has established an online business school that, through its E-learning platform, offers courses and educational programs accessible for anyone, anywhere, anytime. The online business school is provided by International Institute of Executive Careers LLC in order to create future skills for executives and professionals. Its educational programs have all an affordable price, while more than 79,000 professionals have been certified all over world.

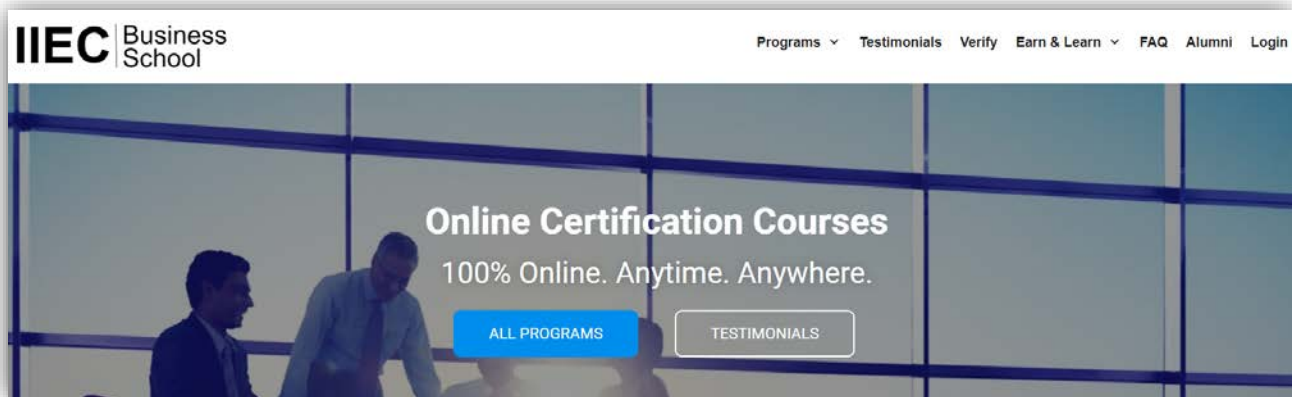


Figure 2-31 Welcome page of IIEC online courses

Importance

The reason why IIEC online business school is chosen is mainly because of the relevance of its content to the digitalization of energy as well as the fact that it uses an active training methodology with a variety of learning formats (text, audio, videos, questions, Q&A, practice libraries etc.).

Courses with relevant content

1. Digital Transformation in Energy and Utilities Certification Course

This is a 10-lesson online program with certification exams. Each lesson requires around 30-minute to get completed. Program Content:

- Digital Transformation: Focus on the Utilities Industry
- The Challenges of Utility Industry Firms
- Digital Transformation Across the Utilities Value Chain
- Digital for Conventional Power Generators
- Digital for Renewable Energy Companies
- Digital in Transmission & Distribution
- Digital Solutions for Retail & Energy Services
- Digital Commodities Trading
- Customer Experience and Commercial Models
- Final Certification Assignment



Digital Transformation in Energy and Utilities Certification Course™

~~\$699~~ \$299

Figure 2-32 Digital Transformation in Energy and Utilities Certification - Course Course overview

2. Online MBA in Digital Energy and Utilities

This is a 90-day online program with certification exams. Each lesson requires around 15 minutes to get completed. Program Content:

- Digital Transformation: Focus on the Utilities Industry
- The Challenges of Utility Industry Firms
- Digital Transformation Across the Utilities Value Chain
- Customer Experience and Commercial Models



Online MBA in Digital Energy and Utilities™ Executive Program

~~\$6,999~~ \$1,997

Figure 2-33 Online MBA in Digital Energy and Utilities - Course overview

2.2.11. Extra courses with relevant content

ASSET Project Courses

ASSET is a Horizon 2020 project, financed under the topic LC-SC3-CC5 "Research, innovation and educational capacities for energy transition". A holistic and scalable solution for research, innovation, and education in energy transition. The overall objective is to deliver the framework and means for the continuous collaborative definition of the knowledge-competencies-skills required for the energy transition and for continuous resource pooling to efficiently educate/train large numbers of people in diverse and interdisciplinary topics and carry out research and innovation activities. Thus, it has created many MOOCs related to energy digitalization, and are all available online in the European Multiple MOOC Aggregator, called EMMA. Some examples are:

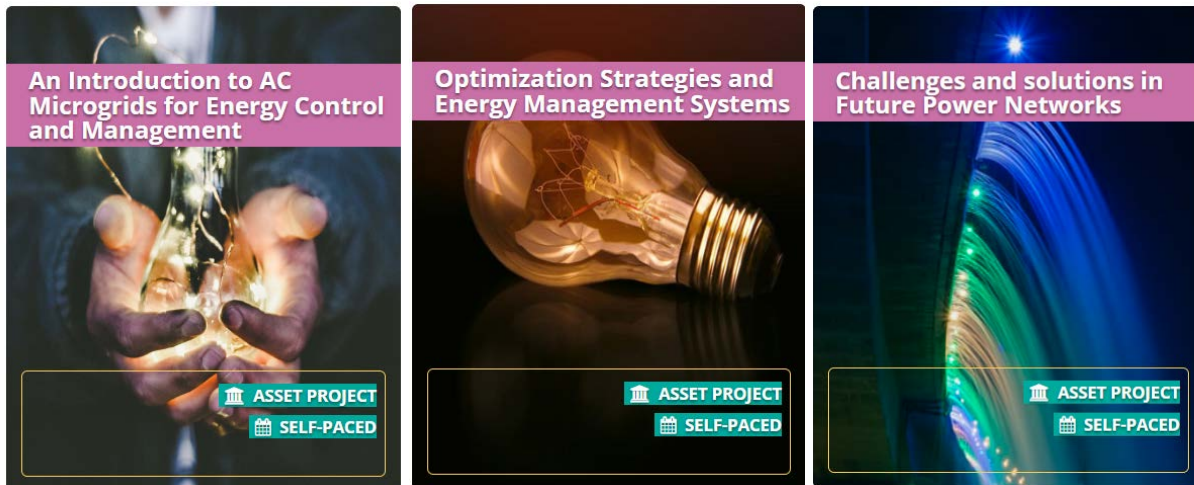


Figure 2-34 ASSET project courses

RENAC - Digitalization and Smart Technologies for the Power Sector

This course focuses on why digitalization is a key driver for building the sustainable power systems of the future and how it can contribute to decarbonisation. It includes:

- The energy economics background of digitalisation of the power sector
- Opportunities and risks of digitalisation for sustainability and decarbonisation
- Key technologies
- Smart generation, transmission and consumption
- Smart markets and process
- Risks and cyber security

Its duration is one month, about 20 hours, and it is accessible with a price of €260 on RENAC E-learning platform.

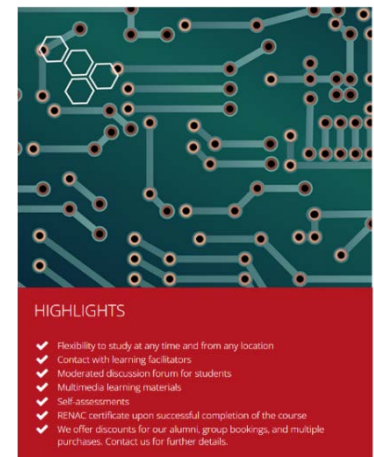


Figure 2-35 RENAC - Course overview

GLOMACS – Digital Energy and Optimization

This GLOMACS Digital Energy and Optimization training course is designed for professionals and companies that want to utilize predictive and prescriptive analytics and software for energy production, storage, distribution and overall optimization of the energy system as a whole. The digital energy transformation is expected to generate trillion of dollars for the energy industry, therefore Industry 4.0 and its energy production and consumption requirements are at the doorstep, and this training course is designed to help you not to be late onboard. The objective of this training course is to prepare the delegates for the digital world and the requirements of Industry 4.0 as it is becoming present in all the sectors and shows special opportunities in the area of energy preservation and optimization. This training course will feature:

- Data Mining techniques and principles
- AI algorithms and models
- Neural networks
- Simulation and creation of digital twins
- Use of Data Mining and AI for Energy Preservation and Optimization

The training will take place in Dubai - UAE from 30 Oct 2023 to 03 Nov 2023, with a price of approximately € 5,600 and it will be available in online format.

3. Description of material available on the EDDIE-website

A new dedicated section for the piloting activities will be created on the EDDIE website. In this section, each piloting activity will be presented and sorted by field test site. The activities are described with a summary, complementary links and available educational material.

3.1. Field Test Aachen

3.1.1. Archimedischer Sandkasten with city of Aachen

The “Archimedean Sandbox” event is a 3-week summer vacation program for school children from 10-16 years old organized by the city of Aachen and supervised by the local educational institution Bleiberger Fabrik in Aachen. Children can sign up for the program on individual days, weeks or the full period. The topic of the program is the energy generation through wind power. The Institute for Automation of Complex Power Systems (ACS) is one of the technical supporters of the program next to other institutes of the RWTH. As a Kick-Off event, the children will visit ACS and interact with a small wind park and energy grid model. This is a starting point for children to design and build their own wind setup. ACS will give advice to the children in two meetings on their own wind setup project in the city center of Aachen. Furthermore, a part of the program will be an open fair for the public. At this event, ACS presents the same wind park and energy grid model to interested pedestrians. In the following, you can find two links disseminating the program (in German).

Links

- <https://aachenerkinder.de/archimedischer-sandkasten-auf-dem-katschhof/>
- <https://futurelab-aachen.de/archimedischer-sandkasten-2022/>

Documents

3.1.2. Gymnasium Workshop

The Gymnasium Workshop is a workshop provided by the Institute for Automation of Complex Power Systems (ACS) to pupils of the lower secondary level. It is a two-day workshop in a STEM group. The aim is for students to understand the challenge of the energy transition and to develop possible solutions offered by the digitalisation of the energy sector. In the first part of the workshop, they acquire basic knowledge on the topics of the energy transition and digitalisation in the form of interactive lectures. In the second part, participants have the opportunity to visualise the effects of small changes in the power grid using the Lite Emulator of Grid Operations (LEGOS) platform developed by RWTH. LEGOS is a multi-layer learning platform for demonstrating use cases of smart energy services. By means of some simple tasks, the students independently learn about the basic interrelationships in the power grid. First, they reconstruct a simple power grid by connecting the individual nodes and branches. They learn how to recognise the relationship between voltage, current and resistance and how to determine the power generated and consumed. After this introduction, they gain an initial understanding of the stability in the power grid by simulating short circuits at different locations and working together to find the best solutions to ensure security of supply in the event of a short circuit. The last part deals with the integration of renewable energies as decentralised power plants.

Links

LEGOS: <https://git.rwth-aachen.de/acs/public/teaching/legos/concept>

Documents

- Presentation slides of the workshop

3.1.3. Workshop on Data Platforms for the Energy Infrastructure

Together with the Institute for Electro Mobility of the Bochum University of Applied Sciences, the ACS will organize a workshop on open source data platform the energy infrastructure in the IDEASFORUM e.V. of the City of Herne. The workshop will give a general overview of the challenges of data management. The focus will be the presentation of smart city applications with FIWARE and Message Queue Telemetry Transport (MQTT) and the display of different functions with demonstrators. Part of the workshop will be a general introduction to FIWARE as well as MQTT, practical examples and demonstrations of smart city applications and the presentation of smart energy business models. To find out more about the IDEASFORUM e.V. of the City of Herne or the FIWARE platform visit the websites linked below.

Links

- IDEASFORUM: <https://ideasforum.org/>
- FIWARE: <https://www.fiware.org/>

Documents

- Presentation slides of the workshop

3.1.4. Summer School on smart electrical power systems

The RWTH International Academy is organising a two-week Summer School called “Smart Electrical Power Systems” in July 2023. The content of this program is about the current challenges and new technologies with regards to the future of electric grids, renewables and Smart Electrical Power Systems. The students will have the opportunity to learn about measurement techniques and distributed intelligence for power systems, discuss the future of electrical grids and microgrids, and discover real time simulations of power systems. This will be achieved through an understanding of the key challenges of future power systems. To sign up for the summer school or to get more information visit the website of the RWTH International Academy with the link below.

Links

- RWTH Academy: <https://www.academy.rwth-aachen.de/en/programs/short-courses/detail/summer-school-smart-electrical-power-systems>

Documents:

- Material from the lectures

3.1.5. Leonardo lecture on energy transition

The Leonardo lecture series “Energy Transition – Potential Tension between Economy, Politics and Science” at RWTH is an interdisciplinary teaching series of lectures open to all students. Lecturers from different scientific backgrounds and industry collectively offer this course to a broad audience by highlighting different parts of the energy transition. Depending on the study regulations and performance, 2 ECTS credits can be acquired through participation and a protocol with a critical analysis. In addition, a Certificate of Participation (0 CP, not graded) is possible. The main part of this pilot activity is the lecture “Digital Energy Revolution” by Prof. Monti from the Institute for Automation of Complex Power Systems highlighting the topic digitalization of the energy system and the lecture “Urban Electrical Energy Systems” by Prof. Ponci from the Teaching and Research Area Monitoring and Distributed Control for Power Systems. The presentation of these lectures are available below. To get access to the E-learning Platform Moodle with all the material of the lecture series, contact the organizer listed on the Leonardo website.

Links:

- Leonardo website: <https://www.leonardo.rwth-aachen.de/modules/wise-2022/energy-transition/>
- E-learning Platform: <https://moodle.rwth-aachen.de/course/view.php?id=28859>

Documents:

- Slides from the lecture “Digital Energy Revolution”
- Slides from the lecture “Urban Electrical Energy Systems”

3.1.6. ACS lecture on automation of complex systems

The course Automation of Complex Power System (ACS) teaches skills for designing a modern energy system. This includes the areas of control and automation of the energy system. It focuses in particular on frequency and voltage control as well as potential power quality problems and their solutions. Since modern energy systems are based on renewable energies, initial knowledge of renewable energy sources and alternative grid concepts, such as micro grids, is taught. This includes the power electronic interface as well as control structures for distributed energy sources and for the converters themselves. A large number of renewable energy sources either work with direct current (PV) or use a DC link (wind). Therefore, the concept of DC distribution grids is presented and possible control strategies and protection concepts are elaborated. The increasing share of volatile distributed energy sources requires not only a suitable measurement infrastructure for monitoring the system and appropriate communication standards, but also load management concepts for demand side management. The use of interactive Jupyter notebooks allows students hands-on experience in programming techniques and simulations.

Links

- ACS website: <https://www.acs.eonerc.rwth-aachen.de/cms/E-ON-ERC-ACS/Studium/Lehrveranstaltungen/~dsci/Automation-of-Complex-Power-Systems/?lidx=1>
- E-learning platform: <https://moodle.rwth-aachen.de/course/view.php?id=21644>
- Jupyter notebooks: <https://jupyter.rwth-aachen.de/hub/spawn>

Documents

- Learning materials

3.1.7. Science Night at RWTH

The Science Night is an event organised by RWTH Aachen University to explain science in a way that is understandable and tangible for all generations. The Institute ACS offers an introduction to the topic of electricity grids by means of a presentation. The presentation entitled "Active customers for active grids" shows the changes in the distribution grid due to the increasing number of decentralised generation plants. Another focus is on grid stability and the associated role of customers. The audience learns about the increasingly active role of customers in the electricity market through decentralised small power plants and solutions such as smart meters. The digitalisation of the energy system serves as a key function for active customers. Some reference solutions such as the award-winning software platform SOGNO developed by RWTH Aachen enable the active integration of customers through digitalisation in the energy sector. In a second part, participants have the opportunity to visually experience the effects of small changes in the power grid using the Lite Emulator of Grid Operations (LEGOS) developed by RWTH. The Gymnasium Workshop is based on the same LEGOS demonstrator.

Links

- RWTH webpage: <https://www.rwth-aachen.de/cms/root/Die-RWTH/Aktuell/Veranstaltungen/~btgg/RWTH-Wissenschaftsnacht-5-vor-12-/>
- LEGOS: <https://git.rwth-aachen.de/acs/public/teaching/legos/concept>

Documents

- Presentation slides

3.1.8. Girls' Day at ACS

Girls' Day is a nationwide career and study orientation project for girls. On this annual day of action, female pupils learn about professions or fields of study in which the proportion of women is less than 40 percent. It is aimed at girls from grade 5 onwards.

The main component of this pilot activity is a seminar for secondary school girls at the Institute for Automation of Complex Energy Systems. The main teaching object is based on the wind farm and energy grid model already used in the "Archimedean sandbox" activity. After an extension, the model on Girls' Day consists of individual modules. The modules themselves represent different areas of the energy system and can be connected with each other as desired. In addition to the previous onshore wind turbines, one module represents an offshore wind farm. LED lights representing the consumers are divided into different consumer groups. The solid capacitors representing an energy storage units and newly integrated PV systems are another part of the landscape.

Links

<https://www.girls-day.de/fakten-zum-girls-day/das-ist-der-girls-day/ein-zukunftstag-fuer-maedchen/deutsch>

RWTH webpage: <https://www.rwth-aachen.de/cms/root/studium/Beratung-Hilfe/Beratung-und-Angebote-fuer-Schuelerinnen/Angebote-fuer-Schuelerinnen-und-Schueler/~cfbk/Girls-Day/>

Documents

3.2. Field Test Cologne

3.2.1. EWI Academy

The course program of the EWI Academy which aims to pass on knowledge from EWI scientists and experts from the energy field to (early career) employees, specialists and executives is becoming increasingly important. These employees, specialists and executives stem from the energy industry, associations and politics as well as from other areas and industries for which an understanding of the energy industry is needed. The course program consists of several modules, which can be taken individually or subsequently, depending on a company's training needs. Topics cover the regulation of electricity markets, all steps of the energy value chain, energy and climate scenarios, energy system modelling, an introduction to the gas market and hydrogen economy, digitization and decentralization in the electricity sector, and an introduction to e-mobility.

Links

- <https://www.ewi.uni-koeln.de/en/ewi-academy/>

Documents

- Slides from the workshop "E-Mobility".
- Slides from the lecture "Introduction to Energy Economics"

3.2.2. Certificate in Future Energy Business

As companies need qualified applicants to fill relevant open positions to cope with the transformation of energy systems, the 'Certificate in Future Energy Business' aims to equip students at the end of their Master studies with the necessary theoretical and practical knowledge in the energy field. The program consists of several courses that EWI and participating companies offer. This approach ensures the practical relevance of the curriculum. The program is designed as a two-semester program with over 15 courses to choose from, consisting of courses on energy economics, future energy perspective, and methods and skills. Students have to take 39 hours of course load and additionally need to participate in a practical project to apply the lecture content to a real-world case.

Links

- Website in progress.

Documents

- Slides on the design of the program.
- Syllabus in progress

3.2.3. Smart Energy Certificate Programme

The fast transition of the energy sector, combined with digitization, puts pressure on existing business models. However, at the same time, it brings new opportunities. Companies need new knowledge in management positions to leverage untapped business potentials. The Certificate targets employees of energy companies and industry who want to deepen their knowledge on digitalization and energy economics. Participants can choose from a wide-range of courses ranging from theoretical courses on energy economics, trading, design thinking, and modelling. In order to receive the certificate, participants have to obtain 39 credits (worth of 9 work of training).

Links

- Website in progress.

Documents

3.3. Field Test Athens

3.3.1. Lectures on Local energy markets, energy communities and Blockchain applications

The lectures on Local energy markets, energy communities and Blockchain applications will be part of the MSc program “Energy Production and Management” of the National Technical University of Athens (NTUA). The program aims to cover a wide range of scientific areas, from conventional & RES production, thermal production and electrical installations to energy economics, energy savings, sustainable environmental management, energy markets and digitalization of energy systems. The successful completion of the whole MSc program provides the students with 60 ECTS credits and the preparation and successful examination of the postgraduate thesis offers additional 30 ECTS credits. This pilot activity is presented as two lectures during the ‘Digitalization of Energy Systems course’ at the second semester of the MSc program.

The lectures will focus on Local Energy Markets (LEMs) and the role of Blockchain technology in securing the decentralized coordination of distribution grids. The content of the lectures is being developed with the aim to mitigate part of the skill gaps identified through the EDDIE project on the skill gaps that these lectures are targeting, which are digital platforms, Blockchain, computing tools & platforms, mathematical optimization, and data analysis. The first lecture contains an overview on smart grids structure, basic components, and stakeholders in the flexibility market, followed by the basic structure of the Greek energy market and the relevant stakeholders, focusing on Energy Communities. This overview is followed by a further analysis of LEMs, trading methods inside them and some LEM formulation methods as examples, concluding to a case study of the operation of a LEM, to elaborate on the problem of optimization. The second lecture contains an overview of distributed computer network protocols and Blockchain technologies, followed by an analysis of Bitcoin and Ethereum examples. Ethereum example is then connected to smart contracts and the definitions of transactive energy & decentralized energy markets. The lecture also includes two examples that connect LEM operation with decentralized applications, protocols, smart contracts and Ethereum based applications.

Links:

MSc program “Energy Production and Management” website: <http://epm.ntua.gr/>

Documents:

- Slides from the lecture “Local Energy Markets in the context of smart grids”
- Slides from the lecture “Securing the Decentralized Coordination of Active Distribution Grids with Blockchain”

3.3.2. Lectures on Artificial Intelligence applications on energy systems: Dynamic security and forecasting

The lectures on Local energy markets, energy communities and Blockchain applications will be part of the MSc program “Energy Production and Management” of the National Technical University of Athens (NTUA). The program aims to cover a wide range of scientific areas, from conventional & RES production, thermal production and electrical installations to energy economics, energy savings, sustainable environmental management, energy markets and digitalization of energy systems. The successful completion of the whole MSc program provides the students with 60 ECTS credits and the preparation and successful examination of the postgraduate thesis offers additional 30 ECTS credits. This pilot activity is presented as two lectures during the Digitalization of energy systems course at the second semester of the MSc program.

The lectures will focus on AI applications on energy systems and specifically on dynamic security and forecasting. The content of the lectures is developed based on artificial Intelligence, mathematical optimization, forecasting, data analysis, machine learning as identified skill gaps. The first lecture contains an overview of machine learning and dynamic safety of power systems and the benefits that machine learning can offer in the power systems dynamic safety assessment. The lecture continues with further analysis of machine learning, containing training sets, classifiers, decision trees and evaluation, ending with an example of classifiers application into a Greek island’s power system. The second lecture contains an introduction to power predictions and mathematical formulation of forecasting, based on power conversion functions. Artificial neural networks, as a valuable tool for power forecasting, are described and their training process analysed, complemented by an actual example. The model

training process evaluation and the basic evaluation metrics are presented and elaborated through an example that applies various metrics for the evaluation into a power prediction application.

Links:

- MSc program “Energy Production and Management” website: <http://epm.ntua.gr/>

Documents:

- Slides from the lecture on “Application of supervised machine learning for dynamic safety assessment in power systems”
- Slides from the lecture “Introduction to RES production forecasting”

3.3.3. Introductory lecture into MOOC on advanced validation methods for smart grids

The MOOC will be hosted in the Moodle platform developed in the context of ERIGrid 2.0 project (H2020 project). It will be developed to act as a learning program on using advanced laboratory testing methods for the validation of electrical and multi-energy systems targeting students, researchers, and professionals. The MOOC will be comprised of 4 core seminars, together with an introductory one and a conclusion. Each one of the seminars will consist of a 30-40 min video presentation and additionally, some of the core seminars will utilize tools developed in the frame of the project to include them as tutorials. EDDIE will participate in the MOOC with the introductory lecture presenting the main targets of EDDIE projects, the identified skill gaps, as well as the Blueprint Strategy for the mitigation of these skill gaps.

Links:

- ERIGrid 2.0 website: <https://erigrd2.eu/>

3.3.4. Participation in ERIGrid 2.0 Summer School

The summer school is organized in the context of ERIGrid 2.0 project (H2020 project) and will take place during summer 2023, lasting 3-4 days. The summer school aims to reach a wide range of EQF level participants, focusing on modern power systems and smart grids. Tentative to be covered during summer school are microgrids, real-time simulation of modern power systems, control and power hardware-in-the-loop simulation setups, adaptive power system protection, ancillary services provision by DERs, operation and control of distribution networks, power system / smart grids resilience, small wind turbines construction. EDDIE will take part in summer school with a presentation, focusing on the dissemination of the targets and outcomes of the project, and especially on the skill gaps identified at the digitalization procedure of the energy sector.

Links:

- ERIGrid 2.0 website: <https://erigrd2.eu/>

3.4. Field Test Milan

The pilot activity conducted by Politecnico di Milano aims to produce and test an online learning program (MOOC), open-access and free of charge. The course is designed to respond to some of the skill gaps that emerged from the analyses conducted in WP2 and to test part of the Blueprint Strategy objectives formulated in WP5.

3.4.1. MOOC “Energy management for real estates”

The course "Energy management for real estates - Fundamentals, methods and digital tools", delivered through the [POK - Polimi Open Knowledge](#), defines the role of the energy manager and explores, through a guided path, the skills and competencies needed to cover this professional role. Hence, it will be targeted at real estate professionals, but will be open to anyone interested in the field.

The energy manager is the professional who handles energy within a company, a public entity, or more generally a facility, checking energy consumption, optimizing it, and promoting interventions aimed at energy efficiency and the use of renewable sources.

In such respect, the course will provide the necessary information to:

- verify consumption, through ad hoc audits or, if available, through digital models or reports produced by remote management.
- optimize consumption through the correct regulation of systems and their appropriate use from an energy point of view.
- promote energy-aware behaviour by employees and/or occupants of the facility.
- propose improvement investments, possibly improving production processes or the performance of related services.

The course will be fully designed, produced and monitored by POLIMI; it will be structured in four Weeks (or sections) and it will mainly consist of video lectures, textual contents and assessment quizzes. Learners who successfully pass the course will receive a certificate of attendance.

Links

- POK: <https://www.pok.polimi.it/>

3.5. Field Test Madrid

3.5.1. Home Energy Efficiency and Electrical Installations

The aim of this training is to establish a complementary training module to the educational offer in Vocational Education Training (VET) at ESCUELAS PROFESIONALES PADRE PIQUER, which explicitly includes the possible restructuring of the electrical installation of a home, and the use of automation to improve energy efficiency and manage the energy consumption. The knowledge acquired can be applied throughout the Spanish national territory as it is based on the state regulations for the electrification of housing, and the training, as well as the model can be exported to any member country of the European Union.

This training develops a complementary training module to the VET offer of electrical technicians, addressing the restructuring of the electrical installation of a home, the application of energy efficiency measures, and the adoption of energy management. The training aims to fill in the current gap in the official training of general electrical installers, as tend to be mainly based on domotic systems for reducing energy consumption in air conditioning and lighting equipment, leaving aside the possible adaptation of the installation of the dwelling to improve energy consumption, the use of smart devices for continuous monitoring and control, and the training in the use of applications to allow such smart operation by both the installer and the user.

The program consist of seven modules starting with the basis of the electrical installations in a house and the regulations, addressing the phantom or idle consumption, the tariffs applicable, the domotic systems, the generation technologies in buildings, the adaptation of the electrical installations, and the consumption management. Special attention is given to the domotic systems, the adaptations of the electrical installations, and the telecommunication and computer applications for energy management.

Within the EDDIE Blueprint, this pilot specifically addresses VET education (EQF 4 & 5), and in particular the adoption of new technologies in the context of domotic systems and smart homes, building new skills for electrical installers, aiming at the digitalization of energy systems, starting with the consumers (and their installations), as the central target that has to drive this transition, and setting the grounds towards transforming their households to more advance functionalities.

Links

- Piquer website: <https://padrepiquer.es>

Documents

- Slides

4. Conclusion

Online learning and E-Learning Platforms have been evolving with the progression of information and communication technologies. They are offering a new learning experience and enabling new education formats. Depending on the topic, the learner's objectives and the instructor's application of E-Learning, there are different types of courses and E-Learning Platforms.

This report presents different types of e-learning platforms. Initially, all those that are used within the framework of the pilot activities. Here, the e-learning platforms are subdivided according to the combination with on-site events and according to purely online courses. In addition, other e-learning platforms relevant to the EDDIE project and its goals are presented, i.e. platforms that have a content-related connection to the digitalisation of the energy sector. This is purely online learning. The in Table 4-1 presented ten E-Learning platforms are identified and two exemplary relevant courses on these platforms are presented:

Table 4-1 Relevant E-Learning platforms for EDDIE

E-learning Platform	Relevant Courses
Coursera	Real-Time Embedded Systems; Big Data Modeling and Management Systems
EdX	Enabling Technologies for Data Science and Analytics: The Internet of Things; Introduction to Blockchain
Udemy	Power Electronics: Control and Simulation of PWM Inverters; Digital Transformation 2022 - Masterclass
LinkedIn Learning	Advance Your Skills in Predictive Analytics; Become a PLC Developer
IEEE Academy	Distribution Automation; Internet of Things
TU Delft Online Learning	Intelligent and Integrated Energy Systems; PV Modeling, Simulation and Analysis
DNV Online Learning	CIM training course; DLMS/COSEM training course
Stanford Online	Transforming the Grid: AI, Renewables, Storage, EVs, and Prosumers; Energy Innovation and Emerging Technologies Program
Future Learn	Battery Storage: Understanding the Battery Revolution; Energy Systems Integration: An Introduction
IIEC Online Certification Courses	Digital Transformation in Energy and Utilities Certification Course; Online MBA in Digital Energy and Utilities

Part of the Blueprint strategy in EDDIE is the deployment of piloting activities in field tests to examine different parts of the strategy. Therefore, 17 individual piloting activities, targeting different EQF levels and designed as different educational programs will be deployed in five field test sites within the scope of the project. To support the dissemination of the activities to a border audience, disseminate the EDDIE topics in education, give access to interested stakeholders, but also to document of the activities, each piloting activity will be presented in a dedicated section of the EDDIE website. Hence in this deliverable, is a brief description of each piloting activity supplemented with supporting Links and documents that will be accessible to interested website visitors. Ultimately, these contents and information will be used to be published on the EDDIE website.