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Engineering curricula modernization in renewable energy in Albanian Universities

ENGINE

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(Deliverable 2.1)

Design of the new VET degree in Electrical Engineering and Renewable Energy

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DEV 2.1 Design of the new VET degree in Electrical Engineering and Renewable Energy.

PUT prepared and submitted all documents for the application for the licensing and accreditation of the new VET study program, the Professional Master Program in Electric Power System (VET) with 120 credits developed by PUT, Department of Electric Power System. Ministry of Education and Sports with Order No.523 Prot. dated 09.09.2022 approved the reorganisation of Professional Master Program in Electric Power System (VET) with 120 credits (level 7). For details on the accreditation process, please, see DEV 2.3.

Master Professional in Electric Power System

No	Index	Courses	Total Credits
1	MP-EN-201	Power Plants	6
2	MP-EN-202	Power system equipments	6
3	MP-EN-203	Power System Analysis	6
4	MP-EN-204	Special equipments in Power system	6
5	MP-EN-205	Elective Course	6
6	MP-EN-206	Design of Electrical Installations and Distribution Networks	6
7	MP-EN-207	High Voltages Techniques	6
8	MP-EN-208	Energetic Economy	6
9	MP-EN-209	Power System Control	6
10	MP-EN-210	Elective Course	6
11	MP-EN-211	Distributed Generation and Microgrid	6
12	MP-EN-212	Power System Monitoring	6
13	MP-EN-213	Power System Relay Protection	6
14	MP-EN-214	Energy Efficiency and Smart Grid	6
15	MP-EN-215	Elective Course	6
16	MP-EN-216	Internship	12
17	MP-EN-217	Diploma Thesis	18

NR	Index	Elective Courses	
5	MP-EN-205	Computer networks and data transmission.	
5	MP-EN-205	Complementary Knowledge on power electronics	
10	MP-EN-210	Electric Management System in smart grid (EMS)	
10	MP-EN-210	Design of Transmission Line	
15	MP-EN-215	Electric Power Quality	
15	MP-EN-215	Computer Platforms for Power System Analysis and Management	

The list of courses is:

1. Energy Efficiency and Smart Networks (Updated compulsory Master level course)
2. Distributed Generation and Energy Efficiency (Updated compulsory Master level course)
3. Design of Electrical Installations and Networks (Updated compulsory Master level course)
4. Power Quality (New elective Master level course)
5. Relay Protection (Updated compulsory Master level course)
6. Interoperability and Control of the Power Grid (New elective Master level course)

The learning outcomes of each course are presented in the table below.

No	Course	Knowledge	Skills	Competences
1.	**Energy Efficiency and Smart Networks** Updated compulsory Master level course	To introduce the concept and benefits of energy efficiency in buildings. To give an overview and classify the methodology used to determine the energy efficiency. To explain and present the different opportunities and measures for reducing energy use.	Ability to appreciate the significance and benefits of energy efficiency. Ability to calculate the thermal load of a building. Ability to calculate analyze and design the basic order of magnitudes of the energy consumption reduction when insulating the facades. Ability to perform cost benefit analyzes for different approaches in a proposed Project for Energy Efficiency combined with smart network	To be able to identify the different opportunities for improving the energy efficiency and the potential savings. Ability to identify and apply the different mechanisms for financing energy efficiency measures. Ability to introduce and implement policies to facilitate energy efficiency in buildings in the country. Knowing what for an employee must be trained to implement on site the energy efficiency measures.
2.	**Distributed Generation and Energy Efficiency** Updated compulsory Master level course	Gaining a basic knowledge of energy production from distributed generation sources, of data handling models;	1. Analyze the power flows, voltage and other parameters that are affected by the presence of these sources.	Ability to design a microsystem and compare different technologies.

		Gaining knowledge and aspects that related to the integration of these resources in distribution and transmission network. To give an overview of the methodology used to determine the energy efficiency. To discuss and present the different opportunities and measures for reducing energy use.	2. To be able to analyze the power supply through distributed generation and estimate the cost of expenses. 3. Ability to appreciate the significance and benefits of energy efficiency. To introduce the concept and benefits of energy efficiency in buildings.	To be able to identify and propose for implementation the different opportunities for improving the energy efficiency and the potential savings. To be able to perform all calculations and define the most adequate network connection point of distributes generators Knowing what for an employee must be trained to study the integration of these energy sources in the network. Knowing what for an employee must be trained to implement on site the energy efficiency measures.
3.	**Design of Electrical Installations and Networks** Updated compulsory Master level course	General knowledge on power supply to urban, industrial and rural consumers and their design. Electrical loads and graphs on electricity consumption. Urban, industrial and rural electricity consumers, their profile of electrical load. The main indicators that determine the load profile. The technical and economic calculations in systems of power	. Able to design urban networks and industrial according to national and international technical standards and methods. To be extensively acquainted with switching devices, different types of urban industrial and rural consumer.	Able to coordinate Project design and Implementation of urban and industrial networks applying the international standards and methods. Able to propose the installation of protection relays and their configurations

		supply for urban industrial and rural consumer. General knowledge about capital investments and expenses systems in systems of power supply for urban industrial and rural consumer. Different methods of technical and economic comparison of variants. Modern methods of the expansion planning of distribution networks. Software for low voltage distribution networks design. (up to 1000 V)	Calculation and selection of protective equipment of electrical networks Able to use the mathematical methods and techniques in technic-economic calculations.	Able to upgrade an existing urban network to comply with the referred standards/ Able to check and verify quality control of the supplied energy.
4.	**Power Quality** New elective Master level course	Gaining knowledge of the physical mechanisms that control phenomena related to Power Quality, concepts that underlie harmonic generation and harmonic flow, and the modeling of voltage sags and swells. Power Quality measurements in the era of smart grid, Power Quality problems caused by Renewable Generators, and Engineering Economics issues related to Power Quality. Able to explain and discuss the effects of disturbances on equipment (transformers, rotating machines, lamps, relays and converters) performance.	Able to evaluate and analyze the effects of disturbances on equipment (transformers, rotating machines, lamps, relays and converters) performance Able to evaluate the different mitigation methods using advanced transformers connections, static, hybrid and active filters are modeled using real-life examples. Able to measure the power quality	Introducing to the team the Power Quality Concept. Design and implement Projects for controlling, monitoring and analyzing the Power Quality. Able to propose and implement case by case different mitigation methods in respect of Power Quality problems caused by Renewable Generators integrated to the network

				Knowing what for an employee must be trained to implement on site the power quality evaluation and measurement for power quality improving.
5.	**Relay Protection** Updated compulsory Master level course	Main signals in the power system: Knowledge on sensor and signals in the power system. Functional schematic blocks "online system" features of digital signals, sampling of signals, signal sampling problems, process-computer system. Basic knowledge on the purpose of use and the role of relay protection devices in the operation of the power system. Familiarity with different types of relay protections used for protection of various equipment in power plants and power plants	Able to analyze the relay protection system in the power system as a whole and its components. Able to analyze the monitoring and supervision system in the power system as a whole and its constituent elements in interactivity with a simple electrical system and in a power system composed of many nodes. Able to calculate the relay settings	Able to re evaluate the existing relay protection scheme and propose new solution that accommodate and address all issues in respect of satisfaction of n-1 criteria due to new investments made in a power system. Able to check and verify the selectivity of different relays installed in the system Able to address issues in respect of congestions, security of the system, frequency control and respective necessary protection measurement. Knowing what for an employee must be trained to implement on site selection and setting of relay protection of equipment.

6.	**Interoperability and Control of the Power Grid** **New elective Master level course**	Gaining a good understanding of Benefits and Challenges of Interoperability Knowledge of Models for Interoperability in the Smart Grid Environment, Explain the technical definition for Interoperability in the Smart Grid Environment Approach to Smart Grid Interoperability Standards Knowledge of Cyber Security Risks and risks mitigation	Ability to analyze and identify the basic order of Interoperability in the Smart Grid Environment Ability to analyze the benefit and identify the associated risks in respect of Interoperability of a Smart Grid Project. Ability to analyze and evaluate the risk and to propose risk mitigation measurements in reference to the implementation of Interoperability Standards .	Ability to project the Smart Grid Network Interoperability in an existing classic network Ability to Implement cyber security and interoperability standards, protocols, tools, and techniques for safe, rapid, and cost-effective Distributed Automation implementation. Knowing what for an employee must be trained to implement on site the Smart Grid Network Interoperability

The syllabi of the courses in Master Professional in Electric Power System are as follows:

Syllabus
Energy Efficiency and Smart Networks

Course topic
Professional Master in Electric Power System Engineering
Number of credits
6 ECTS
Course responsible
Polytechnic University of Tirana
Department of Electric Powe System
Nike Shanku
Course lecturer
Olsi Karapici

Prerequisites
The student must have basic knowledge in the subjects of physics, mathematics and electrotechnics.

Learning outcomes
Upon successful completion of this course students should be able to:

- *To introduce the concept and benefits of energy efficiency in buildings.*
- *To give an overview and classify the methodology used to determine the energy efficiency.*
- *To explain and present the different opportunities and measures for reducing energy use.*
- *Ability to appreciate the significance and benefits of energy efficiency.*
- *Ability to calculate the thermal load of a building.*
- *Ability to calculate analyze and design the basic order of magnitudes of the energy consumption reduction when insulating the facades.*
- *Ability to perform cost benefit analyzes for different approaches in a proposed Project for Energy Efficiency combined with smart network*
- *To be able to identify the different opportunities for improving the energy efficiency and the potential savings.*
- *Ability to identify and apply the different mechanisms for financing energy efficiency measures.*
- *Ability to introduce and implement policies to facilitate energy efficiency in buildings in the country.*
- *Knowing what for an employee must be trained to implement on site the energy efficiency measures.*

Abstract

This course will provide basic knowledge in energy studies aimed at matching demand with supply, as well as research and development efforts in Intelligent Energy Networks to improve energy efficiency, reliability and environmental aspects in energy networks.
More specifically, the course will provide a rich introduction to the new multidisciplinary field of intelligent networks and will address a range of specific topics including demand response, advanced metering networks, communication technologies, power generation and conservation. distributed, electric vehicles, monitoring of the energy system over a wide area, energy markets and cyber security.

Content

Introduction to Energy Systems. Energy Security and Sustainable Development.
Generation, Transmission and Distribution Network.
Introduction to smart grids and the post-carbon economy.
Communications in the Intelligent Network.
Stochastic patterns. Forecast.
Distributed Energy Storage.
Transport Electrification.
Introduction to Distributed Optimization and Control.
Demand management for intelligent networks.
Large-scale power systems.
Cyber Security and Confidentiality in Intelligent Networks.
Social, political and regulatory issues.

Teaching methods

Face-to-face classes
Laboratory practice

Assessment

The course is evaluated 80% according to the final exam and 20% according to the results of controls and assignments.

Recommended reading

Literature lists

- Andres Carvallo, John Cooper, The Advanced Smart Grid: Edge Power Driving Sustainability, 2nd Edition 2015, Artech House
- Bernd M. Buchholz, Zbigniew Styczynski, Smart Grids – Fundamentals and Technologies in Electricity Networks, 1st Edition 2014, Vieweg+Teubner Verlag.

Syllabus
Distributed Generation and microgrid

Course topic
Professional Master in Electric Power System Engineering
Number of credits
6 ECTS
Course responsible
Polytechnic University of Tirana
Department of Electric Powe System
Nike Shanku
Course lecturer
Andi Hida

Prerequisites
The student must have basic knowledge in the subjects of physics, mathematics and electrotechnics.

Learning outcomes
Upon successful completion of this course students should be able to:

- *Gaining a basic knowledge of energy production from distributed generation sources, of data handling models;*
- *Gaining knowledge and aspects that related to the integration of these resources in distribution and transmission network.*
- *To give an overview of the methodology used to determine the energy efficiency.*
- *To discuss and present the different opportunities and measures for reducing energy use.*
- *Analyze the power flows, voltage and other parameters that are affected by the presence of these sources.*
- *To be able to analyze the power supply through distributed generation and estimate the cost of expenses.*
- *Ability to appreciate the significance and benefits of energy efficiency.*
- *To introduce the concept and benefits of energy efficiency in buildings.*
- *Ability to design a microsystem and compare different technologies.*
- *To be able to identify and propose for implementation the different opportunities for improving the energy efficiency and the potential savings.*
- *To be able to perform all calculations and define the most adequate network connection point of distributes generators*
- *Knowing what for an employee must be trained to study the integration of these energy sources in the network.*
- *Knowing what for an employee must be trained to implement on site the energy efficiency measures.*

Abstract

The course aims to provide students with basic knowledge of energy production from distributed generation sources and microgrids. Describe the aspects related to the integration of these resources in the distribution network and the legislative aspects. Micro isolated systems and connected to the electricity distribution network.

Content

Distributed generation sources. Definitions and features.
Distributed operation and generation technologies. Advantages and disadvantages of distributed generation.
Connection of distributed generation in the network..Comparisons between distributed generation technologies.
Basic principles of wind farms. Wind turbine technology. Wind turbine components.
Characteristic curves. MPPT. Mathematical modeling of wind turbine generators. Types of generators used.
Solar energy and photovoltaic technology. Materials for the construction of the photovoltaic cell.
Electrical characteristics of the photovoltaic cell. Characteristic sizes. Yields.
Types of photovoltaic systems. Advantages and disadvantages.
Electricity storage systems. Examples of network technical problems.
Distributed generation and microgrids. Methods and programs for optimization.
Impact of distributed generation integration on the reliability of electricity distribution systems.
DC Distribution Networks. Future trends.

Teaching methods

Face-to-face classes
Laboratory practice

Assessment

The course is evaluated 80% according to the final exam and 20% according to the results of controls and assignments.

Recommended reading

Literature lists

- N. Hobdari, R. Bualoti, Aplikimet e paneleve PV në Shqipëri dhe problemet që lidhen me to. 2007, Tirane
- G.B. Gharehpetian, S. Mohammad Mousavi AGAH, Distributed Generation Systems - Design, Operation and Grid Integration, 2017, Elsevier Inc.

Syllabus
Design of Electrical Installations and Networks

Course topic
Professional Master in Electric Power System Engineering
Number of credits
6 ECTS
Course responsible
Polytechnic University of Tirana
Department of Electric Powe System
Marialis Çelo
Course lecturer
Marialis Çelo

Prerequisites
The student must have basic knowledge in the subjects of physics, mathematics and electrotechnics.

Learning outcomes
Upon successful completion of this course students should be able to:

- *General knowledge on power supply to urban, industrial and rural consumers and their design.*
- *Electrical loads and graphs on electricity consumption.*
- *Urban, industrial and rural electricity consumers, their profile of electrical load. The main indicators that determine the load profile.*
- *The technical and economic calculations in systems of power supply for urban industrial and rural consumer. General knowledge about capital investments and expenses systems in systems of power supply for urban industrial and rural consumer. Different methods of technical and economic comparison of variants.*
- *Modern methods of the expansion planning of distribution networks. Software for low voltage distribution networks design. (up to 1000 V) .*
- *Able to design urban networks and industrial according to national and international technical standards and methods.*
- *To be extensively acquainted with switching devices, different types of urban industrial and rural consumer.*
- *Calculation and selection of protective equipment of electrical networks*
- *Able to use the mathematical methods and techniques in technic-economic calculations.*
- *Able to coordinate Project design and Implementation of urban and industrial networks applying the international standards and methods.*
- *Able to propose the installation of protection relays and their configurations*
- *Able to upgrade an existing urban network to comply with the referred standards/*
- *Able to check and verify quality control of the supplied energy.*

Abstract

The course aims to provide basic knowledge and the main requirements and realization of the design of urban and industrial electrical networks. The course will analyze the complete characteristics of the elements of electrical networks such as conductors, contacts, rails, switches, knives, metering transformers, dischargers, etc. Familiarity with the problems of choosing the elements of an electrical network. To create in students knowledge about the design of simple and complex plants and electrical networks, etc.

Content

Electrical circuits, electrical parameters, cables and electrical conductors
Electrical calculations of R-L lines, Calculations of branched circuits
Applications in network calculation, overload, switching equipment
Protection of electrical networks from overload and short circuits
Protection of electrical networks from overload, short circuits, surges, applications
Transmission and distribution, electric cabins TM / TU
TM / TU cabins, TM / TU distribution systems
Electrical installations for some premises and the project of a tourist village
Electrical project of a villa, a factory and an office
Electrical project of a residential building and recreational sports camping
Electrical project of a sports campsite and a restaurant bar
Electrical design of an electrical cabin plant

Teaching methods

Face-to-face classes
Laboratory practice

Assessment

The course is evaluated 75% according to the final exam and 25% according to the results of controls and assignments.

Recommended reading

Literature lists

- G.Conte Impianti elettrici Vol 1 2007
- G.Conte Impianti elettrici Vol 2 2007

Syllabus
Power Quality

Course topic
Professional Master in Electric Power System Engineering
Number of credits
6 ECTS
Course responsible
Polytechnic University of Tirana
Department of Electric Powe System
Nike Shanku
Course lecturer
Andi Hida

Prerequisites
The student must have basic knowledge in the subjects of physics, mathematics and electrotechnics.

Learning outcomes
Upon successful completion of this course students should be able to:

- *Gaining knowledge of the physical mechanisms that control phenomena related to Power Quality, concepts that underlie harmonic generation and harmonic flow, and the modeling of voltage sags and swells.*
- *Power Quality measurements in the era of smart grid, Power Quality problems caused by Renewable Generators, and Engineering Economics issues related to Power Quality.*
- *Able to explain and discuss the effects of disturbances on equipment (transformers, rotating machines, lamps, relays and converters) performance.*
- *Able to evaluate and analyze the effects of disturbances on equipment (transformers, rotating machines, lamps, relays and converters) performance*
- *Able to evaluate the different mitigation methods using advanced transformers connections, static, hybrid and active filters are modeled using real-life examples.*
- *Able to measure the power quality*
- *Introducing to the team the Power Quality Concept.*
- *Design and implement Projects for controlling, monitoring and analyzing the Power Quality.*
- *Able to propose and implement case by case different mitigation methods in respect of Power Quality problems caused by Renewable Generators integrated to the network*
- *Knowing what for an employee must be trained to implement on site the power quality evaluation and measurement for power quality improving. .*

Abstract

The course aims to give a complete knowledge about the quality of electrical systems. Quality indicators and their monitoring. Energy quality monitoring standards.

Content

Properties of elements that provide electricity with acceptable parameters. Quality of electricity supply.
Production quality. Electrical system quality.
Electricity quality. Definitions of electricity quality. Understanding the quality of electricity.
Interest in the goodness of electricity quality. Efforts are being made for the quality of electricity and the problems associated with it.
The 'desired' voltage and current curves, the real curves of electricity. Graph analysis of electricity parameters.
Measurements with the Power Sight apparatus. Connections of the appliance to the electrical system and the computer. Power Sight Manager programs.
Evaluation of the THD parameter. Time dependencies of electrical system sizes.
Nonlinear loads. Filtering techniques.
Measurements and analysis of parameters at the input and output of UPS.
Analysis and evaluation for 3-phase voltage of Power Grid.
Technical-economic analysis on the investments that can be made to improve the quality of electricity.
Energy quality monitoring standards.

Teaching methods

Face-to-face classes
Laboratory practice

Assessment

The course is evaluated 80% according to the final exam and 20% according to the results of controls and assignments.

Recommended reading

Literature lists

- R. Dugan, M. Mcgranaghn, Electrical power system quality, Third edition 2012, McGraw-Hill Education
- P. Sanjeevikumar, C. Sharmeela, Power Quality in Modern Power Systems, 1st Edition 2020, Academic Press

Syllabus
Relay Protection

Course topic
Professional Master in Electric Power System Engineering
Number of credits
6 ECTS
Course responsible
Polytechnic University of Tirana
Department of Electric Powe System
Nike Shanku
Course lecturer
Nike Shanku

Prerequisites
The student must have basic knowledge in the subjects of physics, mathematics and electrotechnics.

Learning outcomes
Upon successful completion of this course students should be able to:

- *Main signals in the power system: Knowledge on sensor and signals in the power system. Functional schematic blocks "online system" features of digital signals, sampling of signals, signal sampling problems, process-computer system.*
- *Basic knowledge on the purpose of use and the role of relay protection devices in the operation of the power system.*
- *Familiarity with different types of relay protections used for protection of various equipment in power plants and power plants*
- *Able to analyze the relay protection system in the power system as a whole and its components.*
- *Able to analyze the monitoring and supervision system in the power system as a whole and its constituent elements in interactivity with a simple electrical system and in a power system composed of many nodes.*
- *Able to calculate the relay settings Able to re evaluate the existing relay protection scheme and propose new solution that accommodate and address all issues in respect of satisfaction of n-1 criteria due to new investments made in a power system.*
- *Able to check and verify the selectivity of different relays installed in the system*
- *Able to address issues in respect of congestions, security of the system, frequency control and respective necessary protection measurement.*
- *Knowing what for an employee must be trained to implement on site selection and setting of relay protection of equipment.*

Abstract

The course aims to provide basic knowledge on the purpose of use and the role of relay protection devices in the normal operation of the power system. The aim of the course is to get acquainted with the different types of relay protections used for the protection of various equipment in power plants and electrical installations. The course aims to provide basic information on the basic principles underpinning the relay protection system in SE, knowledge of connection diagrams of current and voltage transformers, basic principles of relay protection connection schemes, protection systems of generating units, systems relay protection of transmission units, relay protection systems of consumer units, etc.

Content

Purpose of use of relay protection, selectivity, purpose of use of relay protection, selectivity, speed of operation, sensitivity, safety and stability, methods used to achieve flexibility, selectivity over time, selectivity according to current magnitude, selectivity according to time and direction, selectivity according to the measured distance.

Knowledge on the construction and working principle of relays, general knowledge on relays, maximum current relay of electromagnetic type, voltage relay of electromagnetic type, time relay of electromagnetic type.

Instantaneous current protection, the need to use instantaneous current and the principle of its operation.

Current transformers in relay protection system, voltage transformers in relay protection system.

Electromagnetic relays, basic circuits, basic electromagnetic protection modules.

Static relet.

Numerical relays, base circuits.

Power transformers protection, damage and abnormal modes, instantaneous current protection, differential protection, transformer protection features, unbalanced current in differential protection, transformer magnetization current when energized, differential transformations.

Rail protection, general knowledge, current comparison protection, current braking, high impedance relay protection, current phase protection.

General knowledge on automation in power supply systems.

Protection of power lines, protection of maximum current, protection from ground connection, relays of complete resistance.

I distance myself from its basic principles.

Generator protection and types of damage to generators.

Teaching methods

Face-to-face classes

Laboratory practice

Assessment

The course is evaluated 80% according to the final exam and 20% according to the results of controls and assignments.

Recommended reading

Literature lists

- M. JORGONI, “Mbrotja Rele dhe Automatika ne Sistemin Elektroenergjetik” Tirane 2019 ISBN 978-9928-275-34-9
- The Institute of Electrical Engineers, Power System Protection, ISBN - 0-85296-834-5

Syllabus
Interoperability and Control of the Power Grid

Course topic
Master of Science in Electric Power System Engineering
Number of credits
5 ECTS
Course responsible
Polytechnic University of Tirana
Department of Electric Power System
Aldi Muçka
Course lecturer
Aldi Muçka

Prerequisites
The student must have basic knowledge in the subjects of physics, mathematics and electrotechnics.

Learning outcomes
Upon successful completion of this course students should be able to:

- *Gaining a good understanding of Benefits and Challenges of Interoperability*
- *Knowledge of Models for Interoperability in the Smart Grid Environment,*
- *Explain the technical definition for Interoperability in the Smart Grid Environment*
- *Approach to Smart Grid Interoperability Standards*
- *Knowledge of Cyber Security Risks and risks mitigation*
- *Ability to analyze and identify the basic order of Interoperability in the Smart Grid Environment*
- *Ability to analyze the benefit and identify the associated risks in respect of Interoperability of a Smart Grid Project.*
- *Ability to analyze and evaluate the risk and to propose risk mitigation measurements in reference to the implementation of Interoperability Standards.*
- *Ability to project the Smart Grid Network Interoperability in an existing classic network*
- *Ability to Implement cyber security and interoperability standards, protocols, tools, and techniques for safe, rapid, and cost-effective Distributed Automation implementation.*
- *Knowing what for an employee must be trained to implement on site the Smart Grid Network Interoperability*

Abstract

The course aims to provide basic knowledge on Models for Interoperability in the Smart Grid Environment,
Explain the technical definition for Interoperability in the Smart Grid Environment
Approach to Smart Grid Interoperability Standards
Knowledge of Cyber Security Risks and risks mitigation.

Content

Interoperability
State-of-the-Art-Interoperability
Benefits and Challenges of Interoperability
Model for Interoperability in the Smart Grid Environment
Smart Grid Network Interoperability
Interoperability and Control of the Power Grid
Standards
Approach to Smart Grid Interoperability Standards
Smart Grid Cyber Security
Cyber Security State of the Art
Cyber Security Risks
Cyber Security Concerns Associated with AMI
Mitigation Approach to Cyber Security Risks
Cyber Security and Possible Operation for Improving Methodology for Other Users

Teaching methods

Life & on-line lectures
Webinars

Assessment

The course is evaluated 75% according to the final exam and 25% according to the results of controls and assignments.

Recommended reading

Literature lists

- William Stallings, Data And Computer Communications, Pearson Prentice Hall 2007, ISBN: 0-13-243310-9
- Behrouz A Forouzan, Data Communications and Networking, MC GRAW HIL, 2006, ISBN: 978-0070634145