Study program

Energy Management and Sustainable Development (120 ECTS)

Faculty
Contemporary Sciences and Technologies

Study Cycle
Second Cycle (Postgraduate)

ECTS
120

Title
Master in Energy Management and Sustainable Development

Accreditation archive number [120]
03-1410/1

Decision for running of the program
17-1389/1 (20.05.2016)

Accreditation date
06.07.2015

Description of the program

The renewable energies are important for environmental protection. In WB the contribution of water energy is relatively good. The other renewable energies are up to now nearly not used. So improvement of higher education here is needed. Renewable energy is highly important for the future economy in the partner countries in the Western Balkan region with limited energy resources in a growing economy and with the related environmental problems. Thereby existing studies are upgraded and new Master studies introduced, which are covering the whole field of renewable energy and management.

The study program in Energy Management and Sustainability Development will be developed under special consideration of the specific and combined aspects of energy, environment, economy and legislation. It will address the issue of developing sustainable energy systems in a period of profound and rapid change of national and regional energy markets. The different renewable energy systems such as water and tide, wind, solar energy, chemical energy, geothermal energy, biomass and biogas will be integrated in several courses. Highly important is the integration of economy to analyse the affordability of the different systems and the time scale for the realization of a special affordable energy system. Thereby the storage of energy in a battery or as potential or chemical energy gets a new dimension.

Many renewable energy systems are not permanently available and depend on the climate conditions or the day and night problems. Candidates with different background such as mechanical, electrical, civil, geological, environmental and IT engineering, or economical and natural sciences may apply for this Master program.

The program will focus on the legislative and economic frameworks in partner countries and EU to promote energy efficiency and renewable energy.

The wider objective is therefore the reform of the studies in the partner universities in the field of energy. The specific programme objectives are the establishment of new M. Sc. studies on renewable energy and management.

The new M.Sc. studies are basis for the creation of a network of national and international universities and industry in analogy to very effective solutions in Norway.
The program aim is to provide a solid background in the field of sustainable energy systems, both by illustrating the framework and mechanisms, which govern energy systems and markets and by developing technical knowledge of the most important energy efficient and renewable energy.

**Career**

**Learning outcomes**

**Knowledge and understanding**

- Ability to develop and implement original and creative ideas to ensure qualitative Energy Management and Sustainable Development;
- Ability to apply skills and knowledge and demonstration of specialized competencies in Energy System Analysis, Renewable Energy Technology, Advanced Energy Technologies, Energy Management and Efficiency, etc.;
- Having the knowledge and understanding of the areas environment engineering, electro-technical engineering, mechanical engineering as well as computer science.
- Has knowledge of one or more areas of the environment engineering industry that can qualify students as experts on the application of knowledge in a given area;

**Applying knowledge and understanding**

- Ability to critically, independently and creatively solve problems in new and previously never encountered environments with no previous experience in industry;
- Planning, management and evaluation of independent research in the field of energy technologies and their analyses, and implementation of appropriate tools for testing, simulation and implementation;
- Creativity and originality in the interpretation of the knowledge from science to solve problems related to the objectives of the energy management and energy engineering area;

**Making judgement**

- Ability for creative integration and synthesis of knowledge from several areas in the environment engineering field, and administration processes and systems using IT tools designed and created for a specific issue. Creating educational processes using computer tools and techniques;
- Ability to deal with complex situations associated with specific processes;
- Ability to identify appropriate specialized instances and making sound judgments in situations of lack of complete information or data based on personal, social and ethical principles and responsibilities associated with the application of knowledge and understanding;

**Communication skills**

- Ability to share findings and proposals with rational argument and reliance on them as a professional, and with unskilled people clearly and unambiguously;
- Taking responsibility considerable with shared outcomes; running and initiating activities.

**Learning skills**

- Ability to identify individual needs and directions for individual and autonomous and its performance independently and autonomously in the usual information and quality assurance field;
- Ability to take responsibility for continued private study in specialized areas within the networked economy.
- Ability to take responsibility for further professional development and training.

**List of courses**

**Semester 1**

- [6.0 ECTS] **Scientific Research Methodologies**
- [6.0 ECTS] **Energy and Environment**
- [6.0 ECTS] **Elective course 1**
- [6.0 ECTS] **Free elective course**
- [6.0 ECTS] **Elective course 2**

**Semester 2**

- [6.0 ECTS] **Advanced Energy Technologies**
- [6.0 ECTS] **Energy Management and Efficiency**
- [6.0 ECTS] **Smart Grid**
- [6.0 ECTS] **Elective course 4**
- [6.0 ECTS] **Elective course 3**

**Semester 3**

- [10.0 ECTS] **Sustainable Development**
- [10.0 ECTS] **Energy System Analysis**
- [10.0 ECTS] **Renewable Energy Technology**

**Semester 4**

- [30.0 ECTS] **Master Thesis**

**Description of courses**

**Core courses**

- **Scientific Research Methodologies**
  The purpose of this course is to provide students with knowledge and understanding of different scientific theories and methodologies. Initially the student will be introduced to the conceptual, theoretical definitions and examples of all existing methods of research, hypothesis, direct and indirect variables, validation of the results, the conclusions BIAS and scientific qualitative and quantitative methodologies, "ground research" methodology and other methodological approaches. In each chapter the student will work on practical assignments. After completing the course the student will be able to: explain thoroughly and understand the importance of basic scientific concepts; effective search and information relevant literature; identify, describe and formulate scientific problems; to make a careful choice of alternative research approaches, thoroughly described; compare and explain the advantages and disadvantages of different scientific methods for collecting quantitative and qualitative data; apply basic scientific methods to analyze quantitative and qualitative data; understand different frameworks for building theory and to review and evaluate the scientific publications.

- **Energy and Environment**
  Aims of the course program: Modern society is based on the availability of low cost and reliable energy. Most of this energy currently comes from fossil fuels and with recent technological breakthroughs making unconventional oil and gas resources economic to produce, it appears that we might be able to continue to rely on oil, natural gas and coal for another one or more centuries. There are significant social and environmental costs to our use of fossil fuels, however. These costs stem from problems associated with the extraction, refining and distribution of fossil fuels as well as with their use in transport, manufacturing, buildings and electricity generation. The biggest of these problems are local-to-regional scale water contamination, regional air pollution, and global climate change. Alternatives to fossil fuels include nuclear and renewable energy, but these have environmental costs as well, and in general remain more
expense and complicated to deploy and operate on a large scale. And while increasing energy efficiency and conservation can help reduce environmental impacts of hydrocarbon use, growing population and rising living standards limit the extent to which these particular measures can be implemented.

• **Advanced Energy Technologies**
  Aims of the course program: The topic of this course examines efforts in developing managerial knowledge and skills in the field of advanced energy technologies for students with different background. This course will cover some of timely and complex questions linking existing energy infrastructure, environment and energy technology perspectives. The full spectrum of alternative new energy technologies will be introduced, including how to integrate these technologies to fulfill requirements for energy in a sustainable way. Students will have an opportunity to understand issues related to the current energy crises, which can be an opportunity for making decisions to improve infrastructure networks, technologies and for attaining energy sustainability.

• **Energy Management and Efficiency**
  Aims of the course program: This module covers information that will provide the learner to gain knowledge, skill and competence to investigate, analyze and evaluate, develop and implement energy management strategies in different energy sectors. It enables students to understand the techniques to develop a professional role in energy audit and management along financial appraisals. Learning outcomes: On successful completion of the course, students will be able to: − Explain and recognize about production of energy sources and consumption of energy in the world and in Kosovo, Albania and Macedonia − Apply and analyze methodology of energy management in industry − Conclude and explain policy of energy efficiency in EU and recommendations for energy efficiency policy. − Explain barriers for implementation of energy efficiency measures − Analyze the relationship between energy use and production volume − Analyze and evaluate consumption and recommend energy efficiency measure for electricity systems (tariffs, consumption of reactive power, lighting, motors) − Evaluate consumption and recommend energy efficiency measure for energy system in industry: pumps, fans, compressed air, fuels, combustion and boilers, steam system

• **Smart Grid**
  Aims of the course program: To introduce some key elements of smart grids. To understand the interaction of various disciplines in smart grids. After completing the course the student should have a thorough knowledge of historical, institutional, and technical understanding of the current electric transmission and distribution grid and existing theories and methods in the field of smart grid. Learning outcomes: At the end of this course, the students should be able to: • understand some basic concepts of Smart Metering technology and Smart grids, • explain and recognize about grid automation, the integration of renewable sources, the impacts of electric vehicles (EVs), • explain and recognize about networking skills that are applied in the power systems area, • explain and recognize about developing control solutions for power system applications, • students will learn to analyse existing theories and methods in the field of smart grid, • students will be able to apply and communicate their knowledge and skills in new areas.

• **Sustainable Development**
  Aims of the course program: Knowledge about common items on sustainable development: history, globalization, world community documents; Knowledge about sustainability indicators, indexes and monitoring methods; Knowledge about sustainable resource management; Sustainable development assessment; Life cycle assessment (LCA); Use of software for LCA (Simapro) Society: understanding what society’s institutions are, their role in transformation and development; understanding what democratic systems are, their role in providing with opinion representation, consensus reinforcement and overcoming disagreements. Environment: conscience what resources physical environment has, how much environment is instable and how it is influenced by human activity and decisions with showing settled intention to account ecological disquietudes within development of social and economic policy. Economic-technological line: consideration of all limitations and potential opportunities related to economic growth and their influence on society and environment

• **Energy System Analysis**
  Aims of the course program: Knowledge: have advanced knowledge about energy systems have thorough knowledge about energy system analysis; Skills: be able to analyze existing theories, methodologies, data and results in the field and work independently with practical and theoretical issues. Have a deeper understanding of the systems perspective and analyze different energy systems be able to use energy system analysis tools in order to carry out an independent, limited research or development project; General competence: Be able to convey key topics and master language and terminology of the academic field both in written and oral form.
Renewable Energy Technology
Aims of the course program: The main purpose of this course is to introduce students with renewable energy resources as a substitute for conventional energy resources in future energy demand. Advanced knowledge about different renewable energy resources; Thorough understanding on issues relevant to energy efficiency and energy storage; Advanced knowledge about potential of using renewable energy technologies as a complement to and to the extent possible, replacement for conventional technologies, and possibilities to combining renewable and non-renewable energy technologies in hybrid systems; Knowledge about strategies for enhancing the use of renewable energy resources for future demand. Skills: Analysis on importance of renewable energy solutions for sustainable development; Able to identify sustainable energy solutions for sustainable development; Able to carry out techno-economic assessment; Determination and analyzing emission in conventional energy systems General competence: Develop competency in identifying renewable energy resources availability and utilization; Develop competency in rating different renewable energy technologies; Students demonstrate competency in renewable systems analysis, independently.

Master Thesis
This module enables students to transfer their skills and knowledge to research and make more complex task of the master-thesis. The module is designed to be fully practical and students to acquire the necessary knowledge and skills to approach writing the thesis. The module has unique return result-to enable students to write the master thesis with minimal difficulties, and with maximum efficiency. The course aims to improve research techniques and style of writing paper, taking account to stop illegal means, such as plagiarism and infringement of copyright, which are prohibited by the Statute of SEEU.

Elective courses

District Heating
Aims of the course program: This module examines the underlying thermodynamic principles of advanced building heating, ventilation, and air-conditioning (HVAC) systems, studies integration of power production systems with building environmental control systems, and provides design principles of centralized heating systems. The first part of the course will deal with the determination of heating (and cooling) load of the buildings to be connected to the district heating network. Then, the sizing and the design of the piping network, of the end user heat exchangers and of the central heat generation station will be dealt with and in the final part the fundamentals of a district heating system operation and management will be outlined. In parallel with the course lectures, the student will be required to prepare design work about a small district heating system. Learning outcomes: By the end of the course, students should be able to: • Master the most important concepts about district heating, piping network, heat exchangers, boilers, etc.; • Have a clear understanding of the operation of district heating systems; • Learn about advanced building energy and control systems; • Obtain knowledge about district heating systems; • Gain the skills and tools necessary to evaluate integration of sustainable energy production systems to a given building site; • Study application of combined heat and power systems in a specific building or group of buildings. • Conduct thermal, hydraulic and economic modeling of integrated building energy systems for planning and design; • Apply these concepts to district heating system design.

Energy Market and Policies
Aims of the course program: On successful completion of the course, students will be able to: • Understand basic economic concepts that underlie energy production and end use. • Understand how local, regional, and global institutions affect energy markets and prices. • Become familiar with historical and contemporary public policy issues related to energy in the EU and globally. • Be able to apply this knowledge to analysis of specific energy industries and policy questions. • Students will learn to use SWOT-analysis in assessing the energy policy. Indicators for policy follow up are discussed.

Philosophy of Social Sciences
Aims of the course program: This module covers information that will provide the learner to gain knowledge, skill and competence of the social sciences, including general methodology (explaining, theorizing, testing), the application of philosophy (especially individualism versus holism), the nature of rationality, and the history of theories and concepts. This module offers an advanced survey of current debates about the ontology, methodology, and aims of the social sciences. It will focus on the central issues of the social sciences: Ethno methodology; Evolution; Phenomenology; Rationality; Relativism; Scientific Methods; Textual Interpretations. Learning outcomes: On successful completion of the course, students will be able to: • To understand the goal of the social sciences. The difference between explaining and understanding human behavior; • To explain the different approach in explanation of the social
sciences compare the natural sciences, the peculiarities about human beings and social phenomena; • To understand the social structures, practices, norms, institutions, etc. The relationship between individuals and larger social structures; • To explain the rely not only on facts about individuals and their mental states, but also the cases in which social phenomena cannot be explained in terms of individual behavior; • To understand the value-laden in a different way or to a different degree than natural science, the possibility to have a value-free social science, the possibility to have an objectivity in social science.

**Project Management**

On successful completion of the course, students will be able to: * plan the activities necessary to implement the project, identify their interdependencies, their duration and costs; * prepare the necessary reports and perform all the required communication between the project and the client, as well as among the team members and the other stakeholders. structure the project to its constituent activities; * prepare a Gantt-chart and a network plan for the project and * identify the shortest time needed to complete the project; * use MS Project as a tool in the process of planning, *implementation and review of the project; * define the project, identify its scope and objectives and develop project specification;

**Labor Market**

The main aim of the course - Labour Market is to provide second cycle students with basic and in-depth knowledge in the field of labour market theory and mechanism of functioning in the market economy. The objective of the course Labour Market is to provide and teach students about categories, laws and basic principles through which the labour market functions. The course makes a detailed analysis of behaviour pattern and the role that key agents play in the labour market: individuals, companies and government. The analysis is based on two basic categories labour demand and labour supply, which are applied in almost all the topics that are addressed in this course. The knowledge gained by the students from this course, serves as essential theoretical basis necessary to understand and grasp the different theories and policies that are applied in the labour market. The course aims students to understand how labour markets distribute and use efficiently the rare factor of production- the labour. Lectures include knowledge about the concepts of labour demand and labour supply and their practical application; behaviour of individuals in the labour market, in order to maximize their usefulness; behaviour of companies in the labour market, aiming profit maximization; government's role in the labour market, the different structures of labour markets: labour market in full competition, monopoly in the labour market, the role of unions in the labour market, the bilateral monopoly in the labour market. Lectures and class discussions cover material that may not be in the book and some aspects of the material contained in the basic literature will not be discussed in class, but are left for active studying of the student. Therefore in order the student to achieve success in learning the course is to be present in lectures and workshops by participating actively in the discussion of various issues related to labour market.

**Rhetoric**

During its long history of 2500 years, Rhetoric was used to indicate many different things; but Rhetoric nowadays is considered as the art of persuasion through language. Rhetoric marks the way that an individual is linked to a particular theme or idea in order to convince the other. Rhetoric is characterized by several distinguishing features.

**Multilingualism and Multiculturalism**

The purpose of this subject will be multilingualism in multicultural societies as a social phenomenon. This phenomenon is massive in the world. During the lectures more precise terms will be considered such as: monoculturalism and multiculturalism. The term ‘linguistic nationalism,’ has at least two forms of this nationalism, which collide with each other: for the leaders of the most powerful countries nationalism means expansion, and for minorities it takes the form of defiance and struggle for the affirmation of identity, despite such pressure. The emphasis during the program will be multiculturalism in education. In the schools curricula consists of contents from different cultures.

**Selected Advanced Topics in IT Applications for Preparing a Scientific Paper**

The aim of this subject is: - To display the technical elements, the structure of the text and deign of a scientific research. - To enable students to acquire advanced knowledge and skills from selected advanced chapters of IT applications that will be needed in preparation of the scientific and research paper. - Practical application of these objectives in preparing student’s individual research paper.

**Selected Advanced Topics in Applications for Statistical Data Processing**

The aim of this subject is: - To display the technical elements in the field of statistics: organizing, processing, comparing through analysis and publication of data. - To enable students to acquire advanced knowledge and skills from selected advanced chapters of the applications for statistical data processing. - Practical application of these objectives in statistical processing of data obtained from questionnaires, reports, scientific studies and other
• **Professional Communication**  
The course is focused on the development of those communication skills that are essential for effective functioning in the professional world. Students will study the process for analysis of different communication situations, and will accordingly comprehend them. Among the themes that will be covered are communication in organization, interpersonal and group communication, oral presentations, interviews for employment, professional business letters and interpersonal skills including group dynamics and team work.

• **Methodology of Teaching**  
The aim of the course is to introduce the students to the basic teaching approaches and methods. They are expected to gain knowledge and skills in order to be able to apply the active educational tools. The course also offers development, learning and teaching as concepts and basic practices that allow teachers to teach about the development of thinking. Throughout this course, students will gain both theoretical background and entirety of strategies that will enable them to reflect and develop both their own and their students’ critical thinking.

• **Energy Audit**  
Aims of the course program: On successful completion of the course, students will be able to: - adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems; - understand the operation and type of industry; - realize the depth to which final audit is needed, and conduct and survey monitoring; - assess potential magnitude and cost reduction; - minimize energy costs / waste without affecting production & quality; - minimize environmental effects.

• **Waste Treatments and Disposal**  
Aims of the course program: This course aims to provide detailed knowledge and skills, focusing on key managerial aspects in wastes management, treatment, disposal and recycling options and the role of resource efficiency in conserving resources and contributing to a lower carbon economy. Explaining how the basic principles of wastes and resource management will be implemented and where appropriate, to solve real problem. This course deals with current practices and policies on waste and re-evaluates the need for creating waste in modern societies. With an increase in resource scarcity, there is a need to create waste management systems and technologies that will help societies limit their impact on earth. This class will provide an overview of the current EU waste policy recommendations.