ECO-EFFICIENCY RELATED COURSES AT SLOVENIAN UNIVERSITIES

1. University of Ljubljana

Faculty of Mechanical Engineering / Faculty of Electrical Engineering

Program: Mechanical engineering / Electrotehnical engineering (first program degree)

Course name: Energy and Environment (5 ECTS)

Course Description and objectives

Content of the course consists of three basic areas: environment, energy and process engineering. Environment is discussed in terms of impact human behavior in modern societies to process and quality of environmental spheres. First, it presents the legality of sustainable development and the importance of maintaining the quality of environmental spheres. Below is a description of natural processes in the environmental sphere and the reasons why these processes are in the era of industrialization began to change. Present the most important anthropogenic sources of pollution from noxious gases, to dust, heavy metals, radiation and noise. Turning to the energy sector, whose technology allows civilization with the energy supply. Students learn about technology for the conversion and supply of energy that are environmentally friendly, the exploitation of renewable resources and the final energy. Present the methods and procedures of efficient energy use. Investigate why and where these processes occur in environmentally harmful substances, and what are the consequences of releases to the environment. Familiar with the concepts of emission and immission, the environmental monitoring and environmental requirements. Featured are technologies to reduce air emissions and water pollution and technology strategy and management of waste materials.

Program: Mechanical Engineering (second master's program)

Course name: ENERGY MANAGEMENT (5 ECTS)

Course Description and objectives

Rational use and optimization of energy use and trade in them is a segment that is present in all sectors of industry and economy. The subject of scale in the early chapters thermal energetic analysis of the processes that are most common in industry, electric power and municipal plants. In particular, in the forefront of energy operational efficiency and availability. Described are established models in this area used in the world, including the economic analysis. Turning to the characteristics of systems diagram of operation and their own energy use. Describe the type of production of energy, self-care, and sustainable supply of coordination scenarios of production and consumption of energy and energy products. Track cost analysis and cost

optimization options with modes of operation, the coordination parameters and other technical tools and interventions in the operation of thermal systems. Determining the cost price of energy and its structure, the cost of security and ecology, and evaluation investment in these aspects. The final chapters cover the market and emissions trading scheme, the principles qualified production, variants and sustainable supply systems of international and national
trading in energy and energy products.

2. University of Maribor

Faculty of Mechanical Engineering

Program: Environmental Engineering (first program degree)

Course name: INTEGRATED ENVIRONMENTAL PROTECTION (4 ECTS)

Course description and objectives

The concept of environmental management as a basis for an integrated approach to environmental protection integrated environmental management of the laws of production systems for environmental management (EMS, BS 7750, ISO standards) planning and implementation of an independent audit of the manufacturing process of technological development and ecosystem management on the environmental aspects of raw materials , materials, energy, water products and their suitability for the environment (product lifecycle) ecological balance sheet, methods of ecological balance-sheet analysis and ecological situation.

Objectives of the course is to acquaint students with the objectives of integrated environmental protection of the environment the most appropriate technology and products and by creating circular flow of the reproductive process ensures the rational use of raw materials and energy, so as to minimize waste.

Program: Environmental Engineering (first program degree) / Mechanical Engineering (first program degree)

Course name: Rational use of energy (smoterna raba energije), (4 ECTS)

Course description and objectives

Types of energy and purpose of the use of alternative energy sources (passive systems for heating, active space heating) combined heat and power efficient and economical use of energy - heat integration of the proper construction and thermal protection of the economic thickness of insulation Energy saving (household appliances, modes) Energy Energy and Ecology and the Future Energy company Overview.

Energy is expensive and valuable, following which it is necessary to look carefully at their spending. Students learn the difference between basic energy supply, energy savings and

alternative energy sources, their shapes and forms of rational use. In addition, students produce an energy audit companies, which allows him to come into contact with the company as a benefit for the company.

Program: Environmental Engineering (second master's program degree)

Course name: Ecological engineering (6 ECTS)

Course description and objectives

The basic elements of the environment, history, ecological systems, legislation, regulations. Water pollution, air and soil. Overview of sources and types of pollutants. The impact of pollutants on the environment and their proliferation. Technology, environmental engineering: processing of waste water (basic and advanced techniques), flue gas and reduce air emissions from industrial sources, waste management, noise abatement, environmental impact assessment.
Understanding the effects of environmental pollution and the introduction of primary and secondary measures for reducing them.

Program: Environmental Engineering (second master's program degree)

Course name: Material and energy use of waste (6 ECTS)

Course description and objectives

Separate collection and use of the basic process of substantial waste. Mechanical processing and separating waste, bio-mechanical processes (MBO) and mechanical thermal (MTO) processing the separation of fractions for material and energy utilization. Thermal waste treatment processes to produce energy: burning, incineration, gasification (oxidation, plasma), pyrolysis. Getting fuel from waste and the possibility of their use in conventional combustion plants.
Learn the possibilities of modern material and energy utilization of waste in terms of sustainable development.

Being able to choose the right process material and energy utilization of waste according to their composition and structure taking into account environmental, economic and technological criteria.

Program: Environmental Engineering (second master's program degree)

Course name: FUELS FOR SUSTAINABLE DEVELOPMENT (6 ECTS)

Course description and objectives

Fossil fuels: characteristics, sources and scope of fossil fuels. Alternative fuels and renewable sources (biofuels, hydrogen ...): physical and chemical features, advantages and disadvantages. The use of alternative fuels for different purposes: effects of environmental pollution, strengths, weaknesses, the EU position on alternative fuels, the possibility of manufacturing, research and use of alternative fuels in Slovenia. The use of alternative fuels in internal combustion engines: strengths, weaknesses, necessary modifications to the engines. Alternative vehicle propulsion: electric drive. Hybrid drive.
Focus on Solving the Problems of Environmental Pollution by using Different Fuels, deep knowledge about alternative vehicles and alternative Propulsion Fuels, Promote Creative and Innovative work of Students in the Field of Fuels for Sustainable Development.

Analyzing ways to reduce pollution from vehicle engines using different fuels, evaluation and assessment of the possibility of alternative propulsion and alternative fuels.

Program: Environmental Engineering (second master's program degree)

Course name: MATERIALS FOR SUSTAINABLE DEVELOPMENT (6 ECTS)

Course description and objectives

The course aims to acquire knowledge in the field of sustainable development materials produced from renewable resources and technologies. Course contents include: Review and vision of renewable energy sources, new processes: green bio-refinery. Sustainable processes, resulting from renewable sources such as life cycle assessment of methods for determining sustainable processes. Output native materials / raw materials: (definition, classification, properties, definition of biogenetic resources - plant, animal, microbial origin, composition renewable source of materials / resources - Primary: plant or animal and inorganic origin, secondary: obtained by simple technological processes, tertiary: acquired through intensive physical / chemical processes). Overview of technologies for the production of renewable resources (high-temperature processes, thermal processes, conditioning, extraction processes), the classification process and determination of the appropriateness of the procedure of choice. Materials for Sustainable Development (eg, materials for renewable energy: fuel cells, hydrogen storage materials, materials for photovoltaics ...). The evaluation process for the use of renewable resources from the viewpoints of basic problems of logistics, the use of renewable resources to produce materials for sustainable development. Laboratory Exercises: Laboratory exercises and seminar work is intended for practical student from renewable sources, which are used as materials for sustainable development, their evaluation and characterization

Demonstrate the importance and utility of renewable resources and technologies to manufacture materials for sustainable development. Give basic theoretical knowledge in the field of renewable energy sources and technologies. Learn about the use of different analytical methods for evaluating materials.

Demonstrate functionality of renewable energy sources and technologies. Familiarize yourself with the proper selection of native materials, processes and technologies. Acquaint themselves with the possibilities of characterization of materials properties and usefulness for sustainable development.

Program: Environmental Engineering (second master's program degree)

Course name: Ecological Construction (6 ECTS)

Sustainable building principles in the EU-guidelines structures and strategies of ecological building facilities in the context of the building envelope construction technology and materials without arch. New strategies barriers Arch. solar building design basic principles of energy efficiency and low energy building, passive thermal protection aspects of construction planning basics lighting systems, energy-saving technical renovation and rehabilitation.

The aim of this course is to acquire the ability to understand the principles of ecologically oriented construction in terms of architectural, structural and technological point of view, acquire and develop relevant special expertise in complex planning and design of buildings.

Students will be able to use acquired knowledge in solving problems in the context of ecological building, while competently incorporate various aspects of planning and design. When this will deepen the knowledge in the core areas of the object.