



RTU Course "Non-Standard Sources of Energy"

15016 Siltumenerģētisko sistēmu katedra

General data

Code	MSE535
Course title	Non-Standard Sources of Energy
Course status in the programme	Compulsory/Courses of Limited Choice; Courses of Free Choice
Course level	Undergraduate Studies
Course type	Professional
Field of study	Heat Engineering, Heat, Gas and Water Technology
Responsible instructor	Rusovs Dmitrijs
Academic staff	Turlajs Daniels
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN, RU, DE
Possibility of distance learning	Planned
Maximum auditorium capacity	30
Maximum number of students per semester	60
Abstract	The subject gives basic knowledge in matters of non-standard and alternative energy sources, sustainable development theory, legislative acts and strategies on different levels that support and promote use of such energy sources and the modernization of utilization technologies. Huge attention is given to energy sources that have been used already for several centuries – solar, wind, running water (oceans, seas, rivers, tidal and ebb energy), biomass. The potential and the level of the utilization technology of every source is carefully evaluated according to technical, economic, environmental aspects. Emphasis is put on efficiency of energy conversion and total profitability. From the same aspects household and industrial waste, sludge from water treatment plants is considered. Interest is also built towards nuclear energy and hydrogen technologies. All sources are evaluated on the level of EU and the Republic of Latvia development plans.
Goals and objectives of the course in terms of competences and skills	To get knowledge about non-standard sources of energy and ways of its usage, basic types of stations and the methodology of definition of parameters, as well as identification of problems in case of utilization of such types of energy. Also it is important to understand and learn how with a high level of efficiency to integrate alternative energy sources into existing heat and electricity supply systems.
Structure and tasks of independent studies	Individual and independent work besides studying of appropriate literature outside the lectures is built on group work. Successful completion of them is taken into account for the final mark of the subject. The variety of individual practical work is very vast, the choice depends on the knowledge level of the group, as well as their interest in particular subjects. The biggest assignment is a discussion about agricultural cultures and infield use for bioenergy production and ethical, social and economical aspects. Final lectures of the semester offer a work in form of debate game about different non-standard energy sources.
Recommended literature	<ol style="list-style-type: none"> 1. "Enerģētikas likums" ("LV", 273/275 (1334/1336), 22.09.1998.) [spēkā ar 06.10.1998.] 2. Nacionālais attīstības plāns 2007-2013. 1. redakcija. 56 lpp. 3. Enerģētikas attīstības pamatnostādnes 2007. – 2016. gadam (Informatīvā daļa). 97 lpp. 4. DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. 5. OPTRES Assessment and optimisation of renewable energy support schemes in the European electricity market. Final report. Ragwitz M. et al. Karlsruhe, 2007. 246 pages. 6. Gulbis V., Birzietis G. Par biodīzeļdegvielas kvalitāti, lai tuvinātu biodīzeļdegvielas īpašību kopumu fosilās dīzeļdegvielas īpašībām. Rīgas 2006. 116 lpp. 7. Kalniņš A. Biogāzes iespējas un tās kā transportlīdzekļu degvielas izmantošana. Rēzekne: Latgales druka, 2007. 95 lpp. 8. Bent Sorensen, Renewable energy, ISBN 0-19-926178-4 Elsevier Academic Press, 2004. 930 pages. 9. Godfrey Boyle, Bob Everett, Janet Ramage, Energy Systems and Sustainability ISBN 0-19-926179-2, 2003. Oksford University Press, 620 pages 10. Godfrey Boyle, Renewable energy, ISBN 0-19-926178-4 Oksford University Press, 2004. 452 pages 11. Wackernagel M., Rees W. Unser oekologischer Fussabdruck. Wie der Mensch Einfluss auf Umwelt nimmt. Berlin: Birkhaeuser Verlag, 1997. 194 s.
Course prerequisites	Heat utilizing equipment, thermal power plants, basics of environment protection, technical thermodynamics.

Course outline

Theme	Hours
Non-standard sources of energy, types and features. The notion of alternative and renewable energy sources.	3
Solar energy. Photovoltaics and solar collectors. Use and calculus.	3
Wind energy. Equipment, use, calculus.	3
Hydro energy, hydroelectric dam.	3

Energy of small rivers. Basics of calculus. The evaluation of perspectives.	3
Bioenergy. Obtaining of biofuel and use in power industry. Evaluation of technical plants and their classification.	3
The use of straws and stalks in power industry. Energetic bushes and other plants.	3
Wood use in energy generation. Analysis of statistics. Problems and solutions of the branch.	3
Tidal-ebb and wave energy.	3
Geothermal energy and calculus of necessary equipment.	3
Nuclear energy and nuclear power plant types.	3
Hydrogen use in power industry and other branches.	3
Fuel cells.	3
Magneto hydrodynamic transformers.	3
Thermoelectric and thermoemission engines.	3
MHDG plants.	3

Learning outcomes and assessment

Learning outcomes	Assessment methods
Ability to evaluate the potential of use of non-standard energy sources in a particular territory.	Individual group assignment at the end of the semester, which demonstrates the ability to support and advice energy source for a particular region taking into account its efficiency there.
Ability to define the parameters of non-standard energy source utilization power plant.	Calculation exercises for different types of power plants to define efficiency, incoming and outcoming parameters.
Ability to identify problems connected with utilization of non-standard energy sources.	Discussion on non-standard energy source use in comparison with social, ethical, economical, environmental and technical impact on the region.
Competence in the use of legislative acts that define the use of alternative and renewable energy sources.	Individual assignment with particular directives, laws, norms that regulate the use of alternative and renewable energy sources, the choice of technologies, the procedure of permit obtainment.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests			Tests (free choice)		
			Lectures	Practical	Lab.	Test	Exam	Work	Test	Exam	Work
1.	3.0	4.5	3.0	0.0	0.0		*		*		