RTU Course "Energy Conversion and Efficiency"

11509 Vides aizsardzības un siltuma sistēmu katedra

General data

Code	EAS700
Course title	Energy Conversion and Efficiency
Course status in the programme	Compulsory/Courses of Limited Choice; Courses of Free Choice
Course level	Post-graduate Studies
Course type	Academic
Field of study	Environmental Engineering and Management
Responsible instructor	Ivars Veidenbergs
Academic staff	Agris Kamenders Aivars Žandeckis Dzintars Jaunzems
Volume of the course: parts and credits points	1 part, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, EN
Possibility of distance learning	Not planned
Abstract	Energy Conversion and Efficiency course is related with energy and quality of energy (exergy), energy conversion processes and technological units, where processes are implemented. Distributed energy production and cogeneration, different type of energy technologies and their technical and environmental indicators, energy efficiency, emissions and technological methods of emissions reduction. The estimations of installations and their elements and practical tests in laboratory are made.
Goals and objectives of the course in terms of competences and skills	To get knowledge about different energy technologies and their produced amount of emissions, to understand and perform calculations of produced emissions from energy technologies and select optimal emissions reduction methods, to learn to carry out energy technology assessment by taking measurements.
Structure and tasks of independent studies	Plan of practical work: 1. Analyse of cogeneration and combined cycle plant; 2. Savings of primary resources and fuel in cogeneration plant, comparing with distributed production of heat and power; 3.Estimations of emissions, reduction of emissions in case of cogeneration; 4. Presentation of estimations and laboratory works. Plan of laboratory work: 1. Preparation for laboratory work; 2. Determination of operational parameters of internal combustion engine cogeneration plant; 3. Determination of emissions of internal combustion engine cogeneration plant; 4. Processing and analysing of measured data, preparation of report.
Recommended literature	1.Blumberga D., Veidenbergs I. Kliedētas energosistēmas. Mazas koģenerācijas stacijas. R. RTU izdevniecība. 2008. 2.Nagla J., Saveļjevs P., Ciemiņš R. Siltumtehnikas pamati. R. Zvaigzne. 1981. 3.Nagla J., Saveļjevs P., Cars A. Siltumtehniskie aprēķini piemēros. R. Zvaigzne. 1982.
Course prerequisites	heat engineering, energy technologies

Course outline

Theme	Hours
Energy, Quality of Energy, Exergy	2
Energy conversion and technical solutions, Alternatives	2
Distributed energy supply, Combined heat and power generation (cogeneration), Basic priciples	4
Indicators for cogeneration, Primary energy consumption, Reduction of CO2, Heating load.	6
Energy conversion in steam turbines, Processes and indicators, Applications of steam turbines in cogeneration	6
Energy conversion in gas turbines, Theoretical aspects of gas turbines application, Indicators, Reduction of NOx	6
Energy conversion in internal combustion engines, Technologies, Production of heat and power	6

Learning outcomes and assessment

Learning outcomes	Assessment methods
To be able to evaluate different energy technologies and calculate processes.	Examination: practical/ laboratory works, exam. Assessment criteria: Able to identify different energy technologies and make estimations.
To be able to assess and calculate emissions from energy technologies. Examination: practical/ laboratory works, exam.	Assessment criteria: Able to estimate amount of esmissions from different energy technologies.

To be able to select optimal method for emission reduction from energy technologies. Examination: practical/ laboratory works, exam.	Assessment criteria: Able to define optimal method for emission reduction from energy technologies.
To be able to perform practical assessment of energy technology performance by taking measures.	Examination: practical/ laboratory works, exam. Assessment criteria: Able to analyze performance of energy technology based on measured data.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests			Tests (free choice)		
			Lectures	Practical	Lab.	Test	Exam	Work	Test	Exam	Work
1.	4.0	6.0	2.0	1.0	1.0		*		*		