



RTU Course "Laser Technology in Production and Repair of Vehicles"

15E01 Aeronautikas tehnoloģiju katedra

General data

Code	TRR520
Course title	Laser Technology in Production and Repair of Vehicles
Course status in the programme	Compulsory/Courses of Limited Choice; Courses of Free Choice
Course level	Post-graduate Studies
Course type	Professional
Field of study	Transport
Responsible instructor	Boldirevs Jurijs
Academic staff	Nesterovskis Vladislavs
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	The study subject considers the operation principles of technological solid and gas lasers, their design, as well as the main methods of laser treatment which are used for manufacturing and repair of vehicle parts and units, i.e. laser heating and laser doping of part surfaces, restoration of parts by laser building-up, laser welding of parts, laser infusion of deposited coatings.
Goals and objectives of the course in terms of competences and skills	To provide knowledge about the processes of restoring and manufacturing vehicle parts and units with the help of laser treatment methods; as a result of acquiring these methods and doing laboratory works students will get the following skills: - ability to analyse and choose laser treatment methods for manufacturing of concrete parts and repair processes; - ability to analyse and choose modes of laser treatment for restoration of parts depending on types of defects, degree of work surface wear, materials of parts and their design features
Structure and tasks of independent studies	Analysis of the results of laboratory works and preparation of reports. Preparation for laboratory works. Independent study of the recommended literature.
Recommended literature	1. Nesgovorovs Ļ. (2001). Detaļu atjaunošanas un nostiprināšanas lāzeru tehnoloģija. Lekciju kurss. RTU. Rīga – 60 lpp 1. Л.Я.Несговоров. (2000). Лазерная технология восстановления и упрочнения деталей. Курс лекций. РТУ. Рига – 84 . 3. Л.Я.Несговоров, Ю. М. Болдырев. (1989). Лазерная сварка деталей авиатехники. РИИ ГА. Рига – 58 с. 4. Л.Я.Несговоров. (1995). Лазерное термоупрочнение сталей. РАУ. Рига – 13 с. 5. Л.Я.Несговоров. (1996). Восстановление и упрочнение деталей лазерным легированием. РАУ. Рига – 26 с.
Course prerequisites	Physics, engineering materials, applied mechanics, measuring geometrical parameters of parts; tolerances and fits of parts and joints, engineering methods for parts and materials processing

Course outline

Theme	Hours
Laser treatment methods	2
Operation principle and design of solid technological laser	2
Operation principle and design of gas technological laser	2
Automated laser technological complex: operation principle and diagram	2
Optical systems of material-working lasers	2
Laser heating of parts made of steel and aluminium alloys	2
Strengthening of parts by laser doping	2
Classification of laser welding methods. Laser welding of small thickness parts	2
Laser welding of parts by deep melting of metals	2
Restoration of parts by laser building-up.	4
Laser infusion of coatings deposited on parts	2
Laboratory work "Laser thermostrengthening of steel parts in the process of their manufacturing and repair"	2
Laboratory work "Restoration and strengthening of parts by laser doping"	2
Laboratory work "Restoration of parts by laser welding"	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Students are able to choose types and modes of laser thermostrengthening for vehicle parts and to substantiate their choice	The review and defence of the laboratory work; test.
Students are able to analyse and choose types and modes of laser welding for vehicle parts depending on materials of parts, their size and design shapes	The review and defence of the laboratory work; test.

Students are able to develop a technology for restoration and strengthening of parts by using the laser doping method or laser building-up methods

The review and defence of the laboratory work; test.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests			Tests (free choice)		
			Lectures	Practical	Lab.	Test	Exam	Work	Test	Exam	Work
1.	2.0	3.0	1.5	0.0	0.5	*			*		