



## RTU Course "Industrial Furnaces"

15016 Siltumenerģētisko sistēmu katedra

### General data

Code	MSE317
Course title	Industrial Furnaces
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	Jaundālders Sigurds
Academic staff	Cars Ainārs Turlajs Daniels Soročins Aleksandrs
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	Planned
Maximum auditorium capacity	50
Maximum number of students per semester	50
Abstract	Study course "Industrial Furnaces" includes the following main topics: high temperature thermal engineering processes- characteristics, classification. Industrial furnaces and ovens, principal schemes, the classification and technical structure. Thermal insulation and refractory materials. Types of fuel. Material and thermal balance of furnace. Indicators of performance. Burners and combustion chambers. Rational use of energy. Aerodynamic and heating time calculations.
Goals and objectives of the course in terms of competences and skills	To get acquainted with the technological processes of furnaces, constructive schemes, materials, burners and combustion chambers. Acquire the skills to perform the material heating and basic methods of calculating heat and material balance of furnaces. To get acquainted with exploitation and the auditing procedure of ovens and furnaces.
Structure and tasks of independent studies	Studies of specialized literature. Performance of practical and calculus tasks. Independently developed home work, which is based on the creation and use of furnace for the given technological process.
Recommended literature	1.Osipovs L.. Ķīmijas tehnoloģijas pamatprocesi un aparāti. Rīga, «Zvaigzne», 1991.-680 lpp. 2.Nagla J., Saveljevs P., Cars A.. Siltumtehnikie aprēķini piemēros. Rīga, «Zvaigzne», 1982.-310 lpp. 3.Baukal Ch., Jr. Industrial Combustion Handbook. CRC Press, 2003, 808 pp. 4.Annamalai K., Puri I. Combustion Science and Engineering. CRC Press, 2007, 1121 p. 5.Лебедев П.Д.. Теплообменные, сушильные и холодильные установки. М. -Л., Энергия, 1972. – 288 с. 6.А. Ключников. Высокотемпературные процессы и установки. М., Энергоиздат, 1989, 335 7.А.А. Каранцев Промышленные печи. М., Энергоиздат, 1979 , 440с. 8.А. А. Щукин. Газовое и печное хозяйство заводов. «Энергия», М.-Л. 1980
Course prerequisites	Physics, Technical Thermodynamics.

### Course outline

Theme	Hours
High temperature heat technology processes and their implementation.	6
High temperature equipment- classification, schemes, working principles, materials and refractoriness.	6
Heating and annealing processes, equipment.	6
Melting processes and equipment.	6
Chemical processing technologies of fuels, processes and equipment.	6
Thermal and material balance of high temperature processes.	6
The external heat transfer in working space of furnaces. Methodology of heating time calculations.	6
Calculations of combustion processes and fuel consumption.	6

### Learning outcomes and assessment

Learning outcomes	Assessment methods
Ability to explain and analyze various technologies used in industrial furnaces - operating principles, design and components, application.	Assessment methods: solving of exercises, individual calculation work, seminars, tests, exam. Criteria: ability to explain and analyze the principles of thermal processes and operation of industrial furnaces and ovens.

The ability to calculate thermal and material balance of furnace, determine the material handling (heating) time.	Assessment methods: solving of exercises, individual calculation work, seminars, tests, exam. Criteria: ability to calculate and explain processes and phenomena of the furnace equipment, separating constructions and materials, analyze and justify the types and selection principles.
The ability to choose optimal materials for furnace design stage, demonstrate skills of the actual furnace audit.	Assessment methods: solving of exercises, individual calculation work, seminars, tests, exam. Criteria: Knowledge of materials and refractories of ovens and furnaces, knowledge of audit procedures. Quality of completed calculation work and tests.

**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	2.0	1.0	0.0		*			*	