Faculty of Metalurgy and Technology / ENVIRONMENTAL PROTECTION / TREATMENT OF GASSES

Course:	TREATMENT OF GASSES			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
5470	Mandatory	6	8	2+2+0
Programs	ENVIRONMENTAL PROTECTION			
Prerequisites	There is no conditioning to other subjects.			
Aims	Acquaintance of students with the characteristics, procedures of preparation and use of gaseous substances, emissions and procedures of waste gas treatment.			
Learning outcomes	After passing this exam, the student will be able to: 1) Explain and define the composition and characteristics of the atmosphere; 2) By applying the gas laws, calculate the basic characteristics of gaseous substances; 3) Defines safety measures for the use and storage of gases; 4) Explain and select natural and anthropogenic sources of atmospheric pollution; 5) Defines the most important air pollutants; 6) Describe the technological procedures and equipment for the treatment-purification of waste gases.			
Lecturer / Teaching assistant	Asst. Dr. Nebojša Tadić			
Methodology	Lectures, computational and auditory exercises and, if possible field exercises (visits to companies).			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Gaseous substances: classification and characteristics. Origin, importance and use of gases.			
I week exercises	Calculation of the basic characteristics of gases.			
II week lectures	Basics of thermodynamics of gases. Ideal and real gases. Gas laws.			
II week exercises	Calculation of the basic characteristics of gases.			
III week lectures	Gases and environment. Composition and characteristics of the atmosphere.			
III week exercises	Calculation of basic thermodynamic parameters.			
IV week lectures	Characteristics of certain groups of gases - pure gases, gas mixtures.			
IV week exercises	Calculation of basic thermodynamic parameters.			
V week lectures	Technical gases, classification, production, characteristics, application, transport and storage conditions.			
V week exercises	First midterm exam.			
VI week lectures	Air pollution, natural and anthropogenic sources. Landfill gases.			
VI week exercises	Makeup first midterm exam.			
VII week lectures	Mining gases. Gases created in the welding process.			
VII week exercises	Calculation of the composition and characteristics of gaseous mixtures.			
VIII week lectures	Emission of waste gases from traffic. Influential parameters.			
VIII week exercises	Calculation of the composition and characteristics of gaseous mixtures.			
IX week lectures	Air pollution from industrial processes.			
IX week exercises	Distribution of homeworks and explanation of how to do it.			
X week lectures	Emission of waste gases from thermal power plants.			
X week exercises	Basics of calculation of gas emissions from thermal power plants.			
XI week lectures	Second midterm exam.			
XI week exercises	Basics of calculation of gas emissions from thermal power plants.			
XII week lectures	Procedures and equipment for removing particles from waste gases.			
XII week exercises	Makeup second midterm exam.			
XIII week lectures	Waste gas desulfurization procedures.			

XIII week exercises	Analysis of selected examples of desulfurization of waste gases.
XIV week lectures	Procedures for removing CO2 from waste gases. Geological storage of CO2.
XIV week exercises	Analysis of selected examples of CO2 removal from waste gases.
XV week lectures	Procedures for removing NOx from waste gases. Combined waste gas purification procedures.
XV week exercises	Analysis of selected examples of NOx removal from waste gases. Presentation of homeworks.
Student workload	Weekly: 8 credits x 40/30 = 10 hours and 40 minuts. Total load for the semester: 8 credits x 30 = 240 hours.

Per week	**Per semester**
8 credits x 40/30=10 hours and 40 minuts 2 sat(a) theoretical classes 0 sat(a) practical classes 2 excercises **6 hour(s) i 40 minuts** of independent work, including consultations	Classes and final exam: **10 hour(s) i 40 minuts x 16 =170 hour(s) i 40 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **10 hour(s) i 40 minuts x 2 =21 hour(s) i 20 minuts** Total workload for the subject: **8 x 30=240 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **48 hour(s) i 0 minuts** Workload structure: **170 hour(s) i 40 minuts (cources), 21 hour(s) i 20 minuts (preparation), 48 hour(s) i 0 minuts (additional work)**
Student obligations	The student is obliged to attend lectures and exercises, do and present homework.
Consultations	Consultations are on days when there are lectures and exercises, and on other days by agreement with the students.
Literature	R.C. Flagan, Fundamentals Air Pollution Engineering, Prentice-Hall, 1988; N.P. Cheremisinoff, Handbook Air Pollution Prevention and Control, Butterworth-Heinemann, 2002. K. B. Schnelle, C.A. Brown, Air pollution control technology handbook, CRC Press, 2002. L. Theodeore, Air Pollution Control Equipment Calculation, John Wiley & Sons, 2008; F.G. Kerry, Industrial Gas Handbook - Gas Separation and Purification, Taylor & Francis Group, 2007.
Examination methods	- Active participation in classes, including homework - 10 points in total; - Two colloquiums of 20 points each - 40 points in total; - Final exam – 50 points; - A passing grade is obtained if 50 points are accumulated cumulatively. - The final exam is mandatory.
Special remarks	
Comment	

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points