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Study program: Metallurgical Engineering and Technological Engineering

Level of study: Master Academic Studies

Course: TRANSPORT PHENOMENA 1

Lecturer: PhD Vesna Grekulović, assistant professor

Status of the course: Elective course for study program Metallurgical Engineering and Compulsorycourse for the study program Technological Engineering

ECTS: 8

Prerequisites: Knowledge in mathematics and in mass, heat and momentum transfer is required.

Goal of the course: Familiarising candidates with transport phenomena that occur in extractive metallurgy and metallurgical engineering, and an upgradingof the level of knowledge gained during undergraduate studies.

Learning outcomes: Students acquire advanced knowledge in the field of transport phenomena, with a special emphasis on training how to control and manage of these phenomena in chemical and metallurgical processes.

Course description:

Theoretical classes:

Transport characteristics; Momentum transfer: transport mechanisms, boundary layer transport equations, some partial solutions of these equations; fluid flow regimes; Theory of similarity and dimensional analysis, similarity criteria; Heat transfer: transfer mechanisms; basic heat transfer equations; Heat transfer with the change of phases; Mass transfer: transportmechanisms, basic equations of molecular and convective mass transfer; Models of mass transfer; Interface mass transfer; Simultaneous transfer phenomena; Transfer analogies

Practicals:

Laboratory practical classes, Other forms of teaching, Study research work. Calculations which follow the lectures.

Literature:

Recommended:

1. V. Stanković, Transport phenomena and operations in metallurgy 1, University of Belgrade, Technical Faculty in Bor,1998.*(in Serbian).*
2. V. Stanković, Transport phenomena and operations in metallurgy 2, University of Belgrade, Technical Faculty in Bor,1998. *(in Serbian).*
3. F. Zdanski, Mechanics of fluid, Faculty of Technology and Metallurgy, University of Belgrade; 1995. *(in Serbian).*

Supplementary:

1. R.R.Bird, W.E.Stewart, N.Lightfoot, Transport phenomena, Willey&Sons, New York, 1960.
2. J.Szekely, N.J.Themelis, Rate Phenomena in Process Metallurgy, Willey Int., 1971.
3. G.H.Geiger, D.R. Poirier, Transport Phenomena in Metallurgy, Addison-Wesley Publ.Co., Reading Massachusetts, 1973.

Number of classes per week:				Other classes:
Lectures: 3	Practicals: 2	Other forms of teaching: 1	Study research work:	

Methods of teaching: Lectures on interactive principle and calculations, with consultations.

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation	20	Written exam	20
Practicals		Oral exam	20
Preliminary exams	40		
Term paper			

Study program: Technological Engineering

Level of study: Master Academic Studies

Course: CHEMICAL PRINCIPLES IN ENVIRONMENT PROTECTION

Lecturer: PhD Milan M. Antonijević, full professor; PhD MarijaPetrović Mihajlović, associate professor; PhD Maja M. Nujkić, assistant professor

Status of the course: Compulsory course

ECTS: 8

Prerequisites: Acquired knowledge in undergraduate academic studies.

Course goal: Goal of the course is to introduce students to possible chemical interactions occurring in natural environment and forms of chemical compounds in different environments.

Learning outcomes: Students acquire awareness of the possible detrimental effects of some compounds on the environment. That knowledge is incorporated in the development or maintenance of technological processes inspiring the effort to emit least possible amounts of these compounds in the environment.

Course description: Chemical equilibrium; Equilibrium constant; Ionic equilibrium; Forms of compounds and influence of various factors on distribution of chemical species (molecule and ionic species) formed from these compounds; Chemical interactions in water, air and soil; Redox processes; Acid-base processes in natural environment; Precipitation and complex-forming processes; Behaviour of natural and synthetic materials in environment

Literature:

Recommended:

1. R. ŠećerovSokolović, Inženjerstvo u zaštitiokoline, Tehnološkifakultet, Novi Sad, 2002.
2. A. Kostić, Inženjeringzaštiteživotnesredine, Dosije, Beograd, 2007.

Supplementary:

1. R.F. Weiner, R.A. Matthews, Environmental Engineering - Fourth Edition, Butterworth Heinemann (An Imprint of Elsevier Science), Amsterdam - Boston - London - New York - Oxford - Paris - San Diego - San Francisco - Singapore - Sydney - Tokyo, 2003.
2. P. Carson, C. Mumford, Hazardous Chemicals Handbook -Second Edition, Butterworth Heinemann (An Imprint of Elsevier Science), Oxford - Amsterdam - Boston - London - New York - Paris - San Diego - San Francisco - Singapore - Sydney - Tokyo, 2002.

Number of classes per week				Other classes:
Lectures: 3	Practicals: 0	Other forms of teaching: 3	Study research work:	

Methods of teaching: Classical lectures with interactive discussions, laboratory practical classes, consultations and independent work.

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation	10	Written exam	
Practicals		Oral exam	40
Preliminary exams			
Term paper	50		

Study program: Metallurgical Engineering and Technological Engineering

Level of study: Master Academic Studies

Course: THERMODYNAMICS OF MATERIALS

Lecturers: PhD LjubišaBalanović, assistant professor; PhD Aleksandra Mitovski, assistant professor

Status of the course: Elective course for study programs Metallurgical Engineering and Technological Engineering

ECTS: 6

Prerequisites: Knowledge in thermodynamics and physical chemistry is required.

Goal of the course: Acquisition of necessary theoretical and experimental knowledge in the field of thermodynamics of materials, as well as consideration of connections between thermodynamic and other physical and chemical characteristics of materials.

Learning outcomes: Training for independent work on calculations in the field of thermodynamics of materials and in the usage of basic apparatus for thermal analysis and calorimetry, as well as mastering the application of some of the modern thermodynamic software.

Course description:

Theoretical classes:

Thermodynamics of solutions; Models of solutions; Analytical thermodynamic research; Calculations based on the known phase diagram; Thermodynamic properties prediction of multicomponent metal systems; Thermodynamic modeling; Multicomponent solutions; The relationship between thermodynamic and other physical and chemical characteristics of the alloys: viscosity, surface tension, density, etc; Solid state thermodynamics; Diffusion; Surfaces and phases; Experimental methods in the thermodynamics of materials

Practicals: Laboratory practicals, Other forms of teaching, Study research work

Calculations. Laboratory thermodynamic investigations: calorimetric methods, methods based on EMS measurement, gas phase equilibrium; Laboratory work on basic thermal analysis apparatus; Application of thermodynamic computer software (HSC, Thermocalc, FACT, etc.).

Literature:

Recommended:

1. D. Živković, Termodinamika Materijala, Autorizovana Predavanja, Tehnički fakultet Bor, 2007.
2. S.Stolen, T.Grande, N.Allan, Chemical Thermodynamics of Materials, John Willey&Sons, New York, 2004.
3. C.H.P.Lupis, Chemical Thermodynamics of Materials, Metallurgia, Moscow, 1989. (in Russian)
4. R.A.Swallin, Thermodynamics of Solids, John Willey&Sons, New York, 1962.
5. O.Kubaschewski, C.B.Alcock, Metallurgical Thermochemistry, Pergamon Press, Oxford, 1983.

Supplementary:

1. V.Gontarev, Termodinamika materialov, Univerza u Ljubljani, NTF, Ljubljana, 2000.
2. R.F. Speyer, Thermal analysis of materials, Marcell Dekker, New York, 1994.
3. Ž. Živković, B.Dobovišek, DTA - teorijaiprimena, TF, Bor, 1984.
4. N. Saunders, A.P.Miodownik, CALPHAD, calculation of phase diagrams, a comprehensive guide, Pergamon Materials Series - Elsevier, Oxford, 1998.
5. P. Gabbott, Principles and Applications of Thermal Analysis, Blackwell Publishing, 2007.
6. G. Kostorz, Phase Transformations in Materials, Wiley-VCH Verlag GmbH, 2001.

Number of classes per week				Other classes:
Lectures: 2	Practicals: 1	Other forms of teaching: 1	Study research work:	

Methods of teaching: Lectures, calculations and laboratory practical classes, organized on an interactive basis, with the elaboration of practical examples through a group, individual and combined method of work.

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation	5	Written exam	20
Practicals	20	Oral exam	20
Preliminary exams	5		
Term paper	30		

Study program: Technological Engineering

Level of study: Master Academic Studies

Course: CHEMICAL KINETICS

Lecturer: PhD Snežana M. Milić, associate professor; PhD MarijaPetrovićMihajlović, associate professor; PhD Ana Radojević, assistant professor

Status of the course: Elective course

ECTS: 6

Prerequisites: Necessary knowledge in the field of physical chemistry, chemical technology and chemical processes.

Goal of the course: The aim of the course is to enable the students to solve specific problems, in a creative way, by studying the general principles of the kinetics of various chemical reactions.

Learning outcomes: It is expected of students to better understand the chemical reactions that occur in various technological processes.

Course description:

Theoretical classes:

The course introduces students to the general principles of the law of the velocity of complex homogeneous and heterogeneous chemical reactions, both catalytic and non-catalytic reactions. Application of collision theory and transition state. Basics of homogeneous and heterogeneous catalysis. Influence of temperature, particle size, reagent concentration on the velocity of chemical reactions. Kinetic models. Application in technological processes.

Practicals: Laboratory practicals, Other forms of teaching, Study research work

Laboratory practical classes. Preparation of term paper.

Literature:

Recommended:

1. D. Šepa, Osnovihemijskekinetike, Akademskamisao, Beograd, 2001.

Supplementary:

1. V.V. Ranade, Computational Flow Modeling for Chemical Reactors Engineering, Academic press, San Diego - San Francisco - New York - Boston-London - Sydney-Tokyo, 2002.
2. J.M. Berty, Experiments in Catalytic Reaction Engineering, Elsevier Science B.V., Amsterdam - Lausanne - New York - Oxford - Shannon - Singapore - Tokyo, 1999.
3. R. Sadeghbeigi, Fluid Catalytic Cracking Handbook - Second Edition, Gulf Publishing Company (An Imprint of Butterworth Heinemann), 2000.
4. A.K. Coker, Modeling of Chemical Kinetics and Reactor Design, Gulf Professional Publishing (An Imprint of Butterworth Heinemann), Boston - Oxford - Johannesburg - Melbourne - New Delhi - Singapore, 2001.
5. F. El-Mahallawy, S. El-Din Habik, Fundamentals and Technology of Combustion, Elsevier Science, Amsterdam - Boston - London - New York - Oxford - Paris - San Diego - San Francisco - Singapore - Sydney - Tokyo, 2002.
6. C.B. Alcock, Thermochemical Processes - Principles and Models, Butterworth Heinemann, Oxford - Auckland Boston - Johannesburg - Melbourne - New Delhi, 2001.

Number of classes per week				Other classes:
Lectures: 2	Practicals: 1	Other forms of teaching: 1	Study research work:	

Methods of teaching: Classical lectures with interactive discussions, laboratory practical classes, consultations, independent work of students related to writing term paper.

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation	10	Written exam	
Practicals	10	Oral exam	30
Preliminary exams			
Term paper	50		

Study program: Technological Engineering

Level of study: Master Academic Studies

Course: ANALYSIS OF TECHNOLOGICAL PROCESSES AND ENVIRONMENTAL PROTECTION

Lecturers: PhD Milan M. Antonijević, full professor; PhD Mile D. Dimitrijević, full professor; PhD Slađana Č. Alagić, associate professor; JelenaKalinović, assistant

Status of the course: Elective course

ECTS: 8

Prerequisites: Knowledge on transportation phenomena and chemical principles in environmental protection.

Goal of the course: Assessment of the impact of technological facilities on the environment. Providing the grounds that students will be able to formulate and develop project documentation in the form of an assessment study impact for simple problems.

Learning outcomes: Students acquire and use correctly basic concepts and elements of assessment theory impact. Students have theoretically mastered the knowledge that enables independent or teamwork project on the impact of technological facilities on the environment.

Course description:

Theoretical classes:

Introduction and terminology. Current methodology for the preparation of technical project documentation (development of a study of the impact assessment of industrial chemical technology plants on the environment) and the process of the obtaining of expert opinion (considering relevant state/government institutions). Key regulative elements in regard to the development of a study of the impact assessment of technological plants on the environment, and in particular in regard to the Law on Environmental Impact Assessment, and Law on Planning and Construction. The role of the study of the impact assessment in the construction of industrial facility. Elements of the study of the impact assessment of industrial facilities on the environment. The relation between the study of the impact assessment and technical documentation for the construction of the facilities of chemical technology in regard to the level of project development. Bases for the study of the impact assessment development. Methodological approach of the European Union in the field of impact assessment of technological plants on the environment. Basic EU directives in relation to the subject. Procedure during development of the study of the impact assessment. Public opinion in regard to the impact of technological facilities on the environment. Methodology of impact qualification. The difference between the impact assessment of an industrial plant on the environment and strategic impact assessments. Presentation of a case study. Team case study.

Practicals:

The analysis of the concrete technological process with the estimation of impacts on the environment. Independent work.

Literature:

Recommended:

1. Zakon o proceniuticajanaživotnusredinu, SlužbeniglasnikRepublikeSrbije, 2004.
2. F. Woodard, Industrial Waste Treatment Handbook, Butterworth Heinemann, Boston - Oxford - Auckland - Johannesburg - Melbourne - New Delhi, 2001.
3. P.G. Urben, Bretherick's Handbook of Reactive Chemical Hazards - Sixth Edition - Volume 1, Butterworth Heinemann, Oxford - Auckland Boston - Johannesburg - Melbourne - New Delhi, 1999.
4. P.G. Urben, Bretherick's Handbook of Reactive Chemical Hazards - Sixth Edition - Volume 2, Butterworth Heinemann, Oxford - Auckland Boston - Johannesburg - Melbourne - New Delhi, 1999.

Supplementary:

1. R.F. Weiner, R.A. Matthews, Environmental Engineering - Fourth Edition, „Butterworth Heinemann" (An Imprint of Elsevier Science), Amsterdam - Boston - London - New York - Oxford - Paris - San Diego - San Francisco - Singapore - Sydney - Tokyo, 2003.

Number of classes per week				Other classes:
Lectures: 3	Practicals: 0	Other forms of teaching: 3	Study research work:	

Methods of teaching: Classical teaching with interactive discussions, consultations.

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation		Written exam	
Practicals	20	Oral exam	30
Preliminary exams			
Term paper	50		

Study program: Technological Engineering

Level of study: Master Academic Studies

Course: STRUCTURE AND PROPERTIES OF INORGANIC MATERIALS

Lecturers: PhD Snežana M. Milić, associate professor; PhD Milan Radovanović, assistant professor, BobanSpalović, assistant

Status of the course: Elective course

ECTS: 8

Prerequisites: Necessary knowledge in the field of inorganic chemistry.

Goal of the course: The objective of the course is to introduce students to some contemporary aspects of the structure of inorganic materials with an emphasis on the correlation between the reactivity of certain types of compounds and their structure. The course includes preparation of seminar paper by students. Student which successfully mastered the subject have: (i) expanded their knowledge of the structure of atoms and molecules, as well as on the structure and symmetry of molecules; (ii) gained understanding of modern approaches to acid-base properties of inorganic compounds; (iii) gained today's knowledge in the field of chemistry of metals, complex compounds and some inorganic systems with specific structural and reaction properties; (iv) gained the ability to use literature in this field with critical approach.

Learning outcomes: Students will be able to understand the reactivity of inorganic compounds. This will be of great importance as many inorganic compounds are used as raw materials in various technological processes.

Course description:

Theoretical classes:

The subject deals with the basic factors determining the reactivity of inorganic compounds, with the emphasis on determining a correlation between the reactivity of certain types of compounds and their structure. The subject also provides an overview of the chemistry of some important types of inorganic compounds.

Practicals:Laboratory practicals, Other forms of teaching, Study research work

Laboratory practical classes.

Literature:

Recommended:

1. M. Ohring, Engineering Materials 1 - An introduction to their Properties and Applications -Second Edition, Butterworth Heinemann, Oxford - Amsterdam - Boston - London - New York - Paris - San Diego - San Francisco - Singapore - Sydney - Tokyo, 1996.
2. M.F. Ashby, D.R.H. Jones, Engineering Materials 1 - An introduction to Microstructures, Processing and Design - Second Edition, Butterworth Heinemann, Oxford - Auckland Boston - Johannesburg - Melbourne - New Delhi, 1998.

Supplementary:

1. C.R. Brundle, C.A. Evans, Jr., S. Wilson, Encyclopedia of Materials Characterization - Surfaces, Interfaces, Thin Films, Butterworth Heinemann, Boston - London - Oxford - Singapore - Sydney - Toronto - Wellington, 1992.
2. J.W. Mullin, Crystallization - Fourth Edition, Butterworth Heinemann, Oxford - Boston - Johannesburg - Melbourne - New Delhi - Singapore, 2001.
3. R.W. Cahn, The Coming of Materials Science, Pergamon (An Imprint of Elsevier Science), Amsterdam - London - New York - Oxford - Paris - Shannon - Tokyo, 2001.

Number of classes per week				Other classes:
Lectures: 3	Practicals: 0	Other forms of teaching: 3	Study research work:	

Methods of teaching: Classical lectures with interactive discussions, laboratory practical classes, consultations, independent work of students related to writing term paper.

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation	10	Written exam	
Practicals	10	Oral exam	30
Preliminary exams			
Term paper	50		

Study program: Technological Engineering

Level of study: Master Academic Studies

Course: ELECTROCHEMICAL ENGINEERING

Lecturer: PhD Marija B. PetrovićMihajlović, associate professor, PhD Milan Radovanović, assistant professor, PhD Ana Simonović, assistant professor, PhD ŽaklinaTasić, assistant

Status of the course: Elective course

ECTS: 8

Prerequisites: Required knowledge in physical chemistry and electrochemistry.

Goal of the course: To enable the student to calculate electrochemical parameters of technological processes in production. To enable the student to independently process and interpret electrochemical (ie physicochemical) data and technological parameters in production processes, thus providing a creative approach in considering and resolving specific cases.

Learning outcomes: To complete the student's theoretical knowledge necessary for understanding electrochemical production technologies.

Course description:

Theoretical instruction:

The subject combines theoretical aspects of electrochemistry, the mass and momentum transport phenomena and materials science into a whole, needed to understand industrial electrochemical processes in order to enable the student to be trained, scientifically and professionally,for their operation, improvement and development. Knowledge is also needed to communicate with a qualified working environment and develop a way of thinking and linking facts.

Practicals: Laboratory practicals, Other forms of teaching, Study research work

Calculations and term paper.

Literature:

Recommended:

1.S. Zečević, S. Gojković, B. Nikolić, Elektrohemijskoinženjerstvo, Tehnološko – metalurškifakultet, Beograd, 2001.

Supplementary:

1. L.L. Shreir, R.A. Jarman, G.T. Burstein, Corrosion (Volume1)-Metal/Environment Reactions –Third Edition, Butterworth Heinemann, Oxford - Auckland Boston - Johannesburg -Melbourne - New Delhi, 2000.
2. L.L. Shreir, R.A. Jarman, G.T. Burstein, Corrosion (Volume2)- Metal/Environment Reactions –Third Edition, Butterworth Heinemann, Oxford - Auckland Boston - Johannesburg -Melbourne - New Delhi, 2000.
3. W.vonBaeckmann, W. Schwenk, W. Prinz, Handbook of Cathodic Corrosion Protection - Theory and Practice of Electrochemical Protection Processes - Third Edition, Gulf Professional Publishing (An Imprint of Elsevier Science), 1997.
4. M.E. Parker, E.G. Peattie, Pipe Line Corrosion and Cathodic Protection - Third Edition, Gulf Professional Publishing and Butterworth Heinemann are imprints of Elsevier Science, 1999.

Number of classes per week				Other classes:
Lectures: 3	Practicals: 1	Other forms of teaching: 2	Study research work:	

Methods of teaching: Classical lectures with interactive discussions, calculations and laboratory practical classes, consultations and Preliminary exams.

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation	10	Written exam	
Practicals	10	Oral exam	30
Preliminary exams			
Term paper	50		

Study program: Technological Engineering

Level of study: Master Academic Studies

Course: INDUSTRIAL SOURCES OF AIR POLLUTION

Lecturer: PhD Snežana M. Šerbula, full professor; PhD TanjaKalinović, assistant professor

Status of the course: Elective course

ECTS: 8

Prerequisites: Needed knowledge in the field of air pollution and protection and purification of waste gases.

Goal of the course: Getting to know and understanding industrial sources of air pollution.

Learning outcomes: Selectionof adequate technological process for partially or complete removal of toxic and carcinogenic substances from the industrial gases within the legislative, financial and ecological framework.

Course description:

Classification of industrial sources of air pollution; Measuring and monitoring of industrial air pollutants; Meteorological conditions and air pollution; Methods for removal of pollutants; Contact processes: absorption in the liquid, adsorption on the solid surface, selective separation with membrane process; Chemical conversion with other compounds; Thermal and catalytic combustion of industrial waste gases; Condensation of selected components; Material and energy balance of the technological process for the industrial waste gases purification; Methods for decreasing carbon dioxide emission into the atmosphere; Methods for using alkaline salts for removal of acid gases; Water as sorbent for gas impurities; Removing of sulphur and nitrogen oxides; Membrane processes for gas purification; Various techniques for gas purification.

Practical classes:

Collection of real data from the industry required for the preparation of term paper.

Literature:

Recommended:

1. F. Woodard, Industrial Waste Treatment Handbook, Boston Butterworth–Heinemann, 2001.
2. A. Kohl, R. Nielsen, Gas purification; Gulf Publishing Company, Houston, Texsas, 1997.
3. R.W. Boubel, D.L. Fox, D.B. Turner, A.C. Stern, Fundamentals of Air Pollution – Third Edition, Academic press, San Diego – New York – Boston – London – Sydney- Tokyo – Toronto, 1994.

Supplementary:

1. C. Higman, M. van der Burgt, Gasification, Gulf Professional Publishing is an Imprint of Elsevier, Amsterdam – Auckland – Boston Heilderberg – London – New York – Oxford – Paris – San Diego – San Francisco – Singapore – Sydney – Tokyo, 2003.
2. A.L. Kohl, R.B. Nielsen, Gas Purification - Fifth Edition, Gulf Publishing Company, 1997.
3. P. Carson, C. Mumford, Hazardous Chemicals Handbook - Second Edition, Butterworth Heinemann (An Imprint of Elsevier Science), Oxford – Amsterdam – Boston – London – New York – Paris – San Diego – San Francisco – Singapore – Sydney – Tokyo, 2002.

Number of classes per week				Other classes:
Lectures: 3	Practicals: 1	Other forms of teaching: 2	Study research work:	

Methods of teaching: Lectures with interactive discussions, programming for solving problems (term paper).

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation		Defense of term paper	20
Practicals		Oral exam	30
Preliminary exams			
Term paper	50		

Study program: Technological Engineering

Level of study: Master Academic Studies

Course: THEORETICAL BASES OF MASTER'S THESIS

Lecturer: PhD Jelena M. Djoković, full professor

Status of the course: Compulsorycourse

ECTS: 8

Prerequisites: Passed exams from the first semester.

Goal of the course: Applying knowledge, techniques and skills in order to identify, formulate and solve the given engineering task. Understanding the principles of project and equipment design and the environment necessary for their production. Using computing and statistical methods, simulations and information technologies for analysis and synthesis of results of the study. Implementing standard tests and measuring and providing an overview of results. The goal of the subject is to help the student to acquire experience in academic paper writing and develop the ability to publicly present the results of independent work, as well as to provide answers to the questions related to the topic of the paper.

Learning outcomes: After completing the course, students will be able to team and independently involved in solving problems related to scientific research and professional tasks that will be encounter during their professional mission.

Course description:

Theoretical and practical teaching:

Introduction. Evaluation and comparison of scientific theory, theory and empirical testing hypothesis. Scientific research - nature, types, functions and structure, traditional and new research paradigm, problem investigation hypothesis research, types and the draft research, measurement in the study. General methodology of scientific research. Writing and application of scientific project. Intellectual property in the technical sciences, copyright and patent protection. World-wide scientific research challenges of the 21st century.

Literature:

Current textbooks, journals, library references in the field of topics of the Master thesis.

Number of classes per week				Other classes:
Lectures: 0	Practicals: 4	Other forms of teaching: 0	Study research work:	

Methods of teaching: Theoretical and practical teaching, practical classes, consultation.

Grading system (max. number of points 100)

Pre-examination obligations	**Number of points**	**Final examination**	**Number of points**
Attendance and active participation	10	Written exam	
Practicals	50	Oral exam	40
Preliminary exams			
Term paper			

Study program: Technological Engineering	
Level of study: Master Academic Studies	
Course: PROFESSIONAL PRACTICE	
Lecturer: All lecturers engaged in the study program	
Status of the course: Compulsorycourse	
ECTS: 6	
Prerequisites: Enrolment in second semester.	
Goal of the course: Practical application of acquired knowledge in production conditions or specialized laboratories. In the course of professional practice, the student should adapt to the working conditions in the technological field practice, in order to make better use of the acquired theoretical knowledge in concrete conditions. Preparing for future employment after graduation.	
Learning outcomes: Training students for the practical application of previously acquired theoretical and expert knowledge in solving concrete practical engineering-technical problems in the chemical industry and environmental protection.	
Course description: It is formed for each student in agreement with the management of the company in which professional practice is conducted, and in accordance with the needs of the profession for which the student is being trained. Programs of professional practices for each student are compiled by an assigned teacher - a co-ordinator of professional practice with consulting with other engaged teachers in the study program.	
Number of classes per week, if specified	**Other classes:** 0+0+0+8
Methods of teaching: Practical work or professional practice in an enterprise or institution is carried out according to a predefined program - task that consists in data collection - measurement and analysis in consultation with experts within the company where they conduct professional practice and teachers - coordinator of professional practice. Upon completing the professional practice, the student delivers to the co-ordinator of professional practice a written diary with a description of the activities and work that he performed during the professional practice. Teacher - coordinator of professional practice with his signature in the index confirms that the student has successfully completed the professional practice, which enables the student to verify the semester.	
Grading system (max. number of points 100)	
Professional practice attendance	50
Professional practice defense	50

Study program: Technological Engineering
Level of study: Master Academic Studies
Course: MASTER'S THESIS
Lecturer: All lecturers engaged in the study program
Status of the course: Compulsory course
ECTS: 10
Prerequisites: All exams passed and professional practice realised.
Goal of the course: The goal of preparing and defending the masterthesis is to show, by processing a practical task and defending the result, that student possesses a satisfactory ability to apply theoretical knowledge and practical skills for future engineering practice. Also, through the completion of the studies, the student is trained for fast and an adequate, economically, ecologically and ethically based application of acquired knowledge and skills to concrete, practical engineering examples in a company where he starts a professional career.
Learning outcomes: By carrying out and defending master thesis, students are capacitated, on the basis theoretical and practical knowledge, to operate and innovate the chemical-technological processes, to deal with all the aspects of environmental protection and to continue to doctoral studies. Competencies acquired in this way include the ability of critical thinking, analysis, synthesis and decision making in real time. Specific abilities - knowledge and skills are reflected in the practical application of theoretical knowledge to real problems in practice. This allows master engineers of technology to be involved more quickly in solving real production and environmental problems at the beginning of the professional careers.
Course description: It is formulated for each student individually within the existing areas of the study program technological engineering, in accordance with the given curriculum of the program. Master work represents research work of the student, during which student becomes acquainted with the research methodology used within the chosen research area in which the work is carried out. After conducting the research, the student prepares master thesis, which contains the following chapters: Introduction, Theoretical part, Experimental part, Results and discussion, Conclusion, Literature. Upon completion of the work, the student delivers three copies of the master thesis and publicly defends it in front of the commission made of at least three teachers engaged in this study program.
Methods of teaching: Mentor for carrying out and defending master thesis assigned based on the chosen work area, formulates a topic and tasks for master thesis. Student in consultation with mentor independently solves the task assigned to him. After completion of the work and the approval of the mentor that it is work done successfully, the student defends master thesis in front of a defence committee that consists of at least three teachers. Requirement for the conduct of master thesis work is that all the exams from the teaching subjects are passed and professional practice is realized according to the curriculum of the study program.

Grading system (max. number of points 100)	
Master's thesis preparation	50
Presentation and defense of master's thesis	50