	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

BOOK OF COURSES

STUDY PROGRAM: **TECHNOLOGICAL ENGINEERING**

MASTER ACADEMIC STUDIES

(2ND LEVEL OF THE ACADEMIC STUDIES)

Bor, 2023.

List of courses:

University of Belgrade Technical faculty in Bor	
Accreditation of study program	
MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological engineering

Course: Selected chapters on momentum, heat and mass transport

Lecturer/s: PhD Snezana M. Šerbula, full professor, PhD Snežana M. Milić, full professor

Status of the course: Compulsory course of the Technological Engineering study program

ECTS: 8

Prerequisites: Basic knowledge in the field of momentum, heat, and mass transport.

Course goals:

Within this subject, students are presented with analogies of the transport of movement, heat and mass as a unique science. The goal of the course is for the student, having knowledge the basic phenomena of transport within the Momentum Transport and Heat and Mass Transport in undergraduate level, to see a unique approach to the transfer of movement, heat and mass. The goal is to introduce unique sizes of all three transports, through the analysis of which transport analogies are conceived and corresponded.

Learning outcome:

The student perceives transfer analogies as a coherent science based on common transport mechanisms. The student acquires analytical skills, i.e. learns to connect similar occurrences and phenomena into common dependencies that facilitate further work in related fields.

Course description

Lectures:

Basic concepts of transfer analogy: transfered quantities, own and flow flux; General differential balance; Transport mechanisms and flow regimes; Transport in own field; Laminar flow, Heat conduction; Molecular diffusion; Stationary transport (one-dimensional, two-dimensional); Non-stationary transport; Convective transfer: Boundary layer, Convective transfer rate, Relative transfer rate. Flow through a pipe, Flow through a porous layer; Obstruction. interphase transfer.

Practice:

Creation and processing of individual projects.

Literature

Recommended*:*

1. Cvijović S., Bošković-Vragolović N., Fenomeni prenosa-strujanje, toplota, difuzija, TMF, Beograd, 2006
2. V. Stanković, Fenomeni prenosa i operacije u metalurgiji 1, Univerzitet u Beogradu, Tehnički fakultet, Bor, 1998.
3. V. Stanković, Fenomeni prenosa i operacije u metalurgiji 2, Univerzitet u Beogradu, Tehnički fakultet, Bor, 1998.

Ancillary*:*

1. Welty J.R., Wicks C.E., Wilson R.E., Rorrer G.L.; Fundamentals of Momentum, Heat, and Mass Transfer 5th Edition, John Wiley & Sons, Inc. 2007
2. Bird R.B., Stewart E.W., Lightfoot N.E., Transport Phenomena, Second Edition, John Wiley & Sons, Inc. 2002.

Number of classes per week	**Lectures:** 3	**Practical classes:** 3

Teaching methods

Classic lectures with interactive discussions, laboratory exercises, consultations and preparation of a seminar paper.

Knowledge evaluation (maximum 100 points)

Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance		Written part of the final exam	
Exercise attendance	**20**	Oral part of the final exam	*60*
Colloquium exam/s	**20**	.....	
Term paper			

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological engineering			
Course: Chemical principles in environmental protection			
Lecturer/s: PhD Marija B. Petrović Mihajlović, associate professor			
Status of the course: Compulsory course of the Technological Engineering study program			
ECTS: 8			
Prerequisites: Knowledge acquired from undergraduate academic studies.			
Course goals: The aim of the subject is to acquaint students with possible chemical interactions in the natural environment and the forms of chemical compounds in various media.			
Learning outcome: Students will become aware of how dangerous some substances can be for the environment, and that knowledge will be used during the development or maintenance of technological processes, where they will try to provide that the emission of dangerous substances into the environment remains as low as possible.			
Course description *Lectures*: Chemical equilibrium. Equilibrium constants. Ionic equilibrium. Forms of compounds and influence of different factors on the distribution of chemical species (molecular and ionic species) that arise from those compounds. Chemical interactions in water, air and soil. Redox processes. Acid-base processes in the natural environment. Precipitation and complexing processes. Behavior of natural and synthetic materials in the natural environment. *Practice*: *Practice, Other forms of education, Research studies* Laboratory exercises. Preparation of a seminar paper.			
Literature **Recommended***:* 4. P. Pfendt, Hemija životne sredine, 1. deo (Environmental chemistry, 1. part), Zavod za udžbenike, Beograd, 2009. (in Serbian) 5. R. Šećerov Sokolović, Inženjerstvo u zaštiti okoline (Engineering in environmental protection), Tehnološki fakultet, Novi Sad, 2002. (in Serbian) 6. A. Kostić, Inženjering zaštite životne sredine (Environmental protection engineering), Dosije, Beograd, 2007. (in Serbian) **Ancillary***:* 1. R.F. Weiner, R.A. Matthews, Environmental Engineering - Fourth Edition, Butterworth Heinemann (An Imprint of Elsevier Science), USA, 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. 3. A. Kabata-Pendias, Trace Elements in Soils and Plants, CRC Press, Boca Raton, 4th edn, 2011.			
Number of classes per week	**Lectures:** 3	**Practical classes:** 3	
Teaching methods Classic lectures with interactive discussions, laboratory exercises, consultations and preparation of a term paper.			

Knowledge evaluation (maximum 100 points)

Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance	**10**	Written part of the final exam	
Exercise attendance		Oral part of the final exam	*40*
Colloquium exam/s		.....	
Term paper	**50**		

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological engineering

Course: Chemical kinetics

Lecturer/s: PhD Snežana M. Milić, full proffesor, PhD Marija B. Petrović Mihajlović, associate professor

Status of the course: Elective course of the Technological Engineering study program

ECTS: 6

Prerequisites: Required knowledge of Physical Chemistry, Theoretical foundations of chemical technology and chemical processes

Course goals:

The aim of the course is to enable the students to creatively approach solving specific problems by studying of the general principles of kinetics of various chemical reactions.

Learning outcome:

Better understanding of chemical reactions taking place within technological processes.

Course description

Lectures:

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

Practice:

Practice, Other forms of education, Research studies

Laboratory exercises. Preparation of a seminar paper.

Literature

Recommended*:*

7. D. Šepa, Osnovi hemijske kinetike (Fundamentals of chemical kinetics), Akademska misao, Beograd 2001. (in Serbian)

Ancillary*:*

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

Number of classes per week	**Lectures:** 2	**Practical classes:** 2

Teaching methods

Lectures and calculation exercises and consultations.

Knowledge evaluation (maximum 100 points)

Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance	**10**	Written part of the final exam	
Exercise attendance	**10**	Oral part of the final exam	*30*
Colloquium exam/s		.....	
Term paper	**50**		

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological Engineering

Course: Chemical Thermodynamics

Lecturer/s: PhD Snežana M. Šerbula, full professor; PhD Jelena M. Djoković, full professor

Status of the course: Elective course of the Technological Engineering study program

ECTS: 6

Prerequisites: Required knowledge of physical chemistry and thermodynamics

Course goals

Learning the necessary knowledge in the field of chemical thermodynamics in order to overcome the methods of calculating thermodynamic quantities which are used in the analysis and design of chemical industry plants.

Learning outcomes

Training students to independently solve problems in the field of chemical thermodynamics and to understand its place and importance in relation to other technical and technological disciplines.

Course description

Lectures:

Thermodynamic state functions in chemical reactions. Equations of state. Homogeneous systems of variable composition. Thermal separation processes: distillation, liquid-liquid extraction, sorption. Thermodynamic properties of selective solvents. Ionic solutions. Thermodynamics of electrolyte systems. Thermodynamics of crystallization. Thermodynamics of adsorption. Mesoscopic nonequilibrium thermodynamics. Applied thermodynamics for liquids in the chemical industry.

Practice:

Practice, Other forms of education, Research studies

Numerical examples from all theoretical lectures.

Literature

Recommended:

1. B. Djordjević, M. Kijavčanin, I. Radovanović, S. Šerbanović, Chemical Thermodynamics - engineering aspects, University of Belgrade, Faculty of Technology and Metallurgy (in Serbian), Belgrade, 2013.
2. T. Letcher, Chemical Thermodynamics for Industry, The Royal Society of Chemistry, Cambridge, 2004.
3. H. Donald Brooke Jenkins, Chemical Thermodynamics at a Glance, Blackwell Publishing Ltd, Oxford, UK, 2008.

Ancillary*:*

1. Z. Zavargo, R. Paunović, Basics of Chemical Thermodynamics (in Serbian), Faculty of Technology, Novi Sad, 1997.
2. M. Kijavčanin, B. Djordjević, S. Šerbanović, Chemical Thermodynamics - engineering aspects, Solved problems with extracts from theory (in Serbian), University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, 2007.
3. N. Petronijević, Chemical Thermodynamics (in Serbian), University of Belgrade, Faculty of Physical Chemistry, Belgrade, 2005.

Number of classes per week	**Lectures:** 2	**Practical classes:** 2

Teaching methods

Classic lectures with interactive discussions, consultations and preparation of a term paper.

Knowledge evaluation (maximum 100 points)

Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance	**5**	Written part of the final exam	
Exercise attendance	**20**	Oral part of the final exam	*40*
Colloquium exam/s	**5**	.....	
Term paper	**30**		

University of Belgrade Technical faculty in Bor	
Accreditation of study program	
MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological Engineering

Course: Analysis of technological processes and environmental protection

Lecturer/s: PhD Slađana Alagić, full professor, PhD Maja M. Nujkić, associate professor

Status of the course: Elective course for Technological Engineering study program

ECTS: 8

Prerequisites: Required knowledge in the field of Selected chapters on heat and mass transfer and chemical principles in environmental protection

Course goals

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

Learning outcomes

Students rule and correctly use basic concepts and elements of assessment theory impact. Students have theoretically mastered the knowledge that enables independent or team work project on the impact of technological facilities on the environment.

Course description

Lectures:

Introduction and terminology. Current methodology for the preparation of technical project documentation (development of a study of the impact assessment of industrial chemical technology on the environment) and the process of providing the experts' opinions (considering relevant state/government institutions). Key regulative elements with regard to the development of an impact assessment study of technological facilities on the environment, and in particular with regard to the Law on Environmental Impact Assessment, and the 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 environmental impact assessment of industrial facilities. The relation between the environmental impact assessment study and technical documentation for the construction of the facilities of chemical technology regarding the levels of project development. Bases for the development of the impact assessment study. Methodological approach of the European Union in the field of impact assessment of technological facilities on the environment. Basic EU directives in relation to the subject. Procedure during the development of the impact assessment study. Public opinion with 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 the strategic impact assessments. Presentation of a case study. Team case study.

Practice:

Practice, Other forms of education, Research studies

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

Literature

Recommended*:*

1. M.A. Benvenuto, *Industrial Chemistry*, De Gruyter, 2014.
2. M.A. Benvenuto, *Industrial Organic Chemistry*, De Gruyter, 2017.
3. M.K. Hill, *Understanding Environmental Pollution*, Cambridge University Press, © Marquita K. Hill 1997, 2010.
4. G. Roglić, Osnove tehnoloških procesa u industrijskoj hemiji, Hemijski fakultet, Univerzitet u Beogradu, Beograd, 2017.
5. F. Woodard, *Industrial Waste Treatment Handbook*, Butterworth Heinemann, Boston - Oxford – Auckland - Johannesburg – Melbourne – New Delhi, 2001.
6. Irene Liu, *Environmental Engineers' Handbook,* CRC Press LLC, Boca Raton, 1999.

Ancillary:

1. R.F. Weiner, R.A. Matthews, *Environmental Engineering*, 4th Ed., "Butterworth Heinemann" (An Imprint of Elsevier Science), USA, 2003
2. Encyclopedia of environmental science and engineering, Fifth edition, ed. J. Pfafflin and E. Ziegler, CRC Taylor and Francis, 2006.
3. Zakon o proceni uticaja na životnu sredinu, Službeni glasnik Republike Srbije, 135/2004 i 36/2009.
4. F. Woodard, Industrial Waste Treatment Handbook, Butterworth Heinemann, Boston - Oxford - Auckland - Johannesburg - Melbourne - New Delhi, 2001.
5. P.G. Urben, Bretherick's Handbook of Reactive Chemical Hazards - Sixth Edition - Volume 1, Butterworth Heinemann, Oxford - Auckland Boston - Johannesburg - Melbourne - New Delhi, 1999.
6. 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:	**Lectures:** 3	**Practical classes:** 3

Teaching methods

Classical teaching with interactive discussions, consultations.

Knowledge evaluation (maximum 100 points)

Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance		Written part of the final exam	
Exercise attendance	**20**	Oral part of the final exam	*30*
Colloquium exam/s		.....	
Term paper	**50**		

University of Belgrade Technical faculty in Bor	
Accreditation of study program	
MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological Engineering			
Course: Structure and characteristics of inorganic materials			
Lecturer/s: PhD Milan B. Radovanović, associate professor, PhD Snežana M. Milić, full professor			
Status of the course: Elective course for Technological Engineering study program			
ECTS: 8			
Prerequisites: Required knowledge of Inorganic chemistry.			
Course goals: The aim of the course is to familiarize students with some modern aspects of the structure of inorganic materials with an emphasis on the correlation between the reactivity of certain types of compounds and their structure. Within the course, students will independently write a seminar paper. After successfully overcoming the subject, the students are: (i) expanded their knowledge about the structure of atoms and molecules, as well as about the structure and symmetry of molecules, (ii) gained an understanding of modern approaches to the acid-base properties of inorganic compounds., (iii) have main today's knowledge in the field of metal chemistry, complex compounds, i.e. some inorganic systems with specific structural and reaction properties, (iv) acquired the ability to critically use original literature from this field.			
Learning outcome: After mastering the material from this subject, it will be easier for students to understand the reactivity of inorganic compounds. This will be of great importance because many inorganic compounds are used as starting substances in technological processes.			
Course description *Lectures*: The basic factors that determine the reactivity of inorganic compounds, with the emphasis on establishing a correlation between the reactivity of certain types of compounds and their structure are considered in the subject. The course also provides an overview of the chemistry of some of the more important types of inorganic compounds. *Practice, Other forms of education, Research studies* Laboratory exercises.			
Literature **Recommended***:* 8. M. Ohring, Engineering Materials 1 - An introduction to their Properties and Applications -Second Edition, „Butterworth Heinemann“, 1996, Oxford - Amsterdam - Boston - London - New York - Paris -San Diego - San Francisco - Singapore - Sydney – Tokyo 9. M.F. Ashby, D.R.H. Jones, Engineering Materials 1 - An introduction to Microstructures, Processing and Design - Second Edition, „Butterworth Heinemann“, 1998, Oxford – Auckland Boston - Johannesburg - Melbourne - New Delhi *10.* D. Grdenić, Molekule i kristali, Školska knjiga, Zagreb, 2005 **Ancillary***:* 1. C.R. Brundle, C.A. Evans, Jr.,S. Wilson, Encyclopedia of Materials Characterization - Surfaces, Interfaces, Thin Films, „Butterworth Heinemann“, 1992, Boston - London - Oxford - Singapore Sydney - Toronto –Wellington 2. J.W. Mullin, Crystallization - Fourth Edition, „Butterworth Heinemann“, 2001, Oxford - Boston Johannesburg - Melbourne - New Delhi - Singapore 3. R.W. Cahn, The Coming of Materials Science, „Pergamon“(An Imprint of Elsevier Science), 2001, Amsterdam - London - New York - Oxford - paris - Shannon – Tokyo 4. Z. D. Stanić, Ugljenični materijali u elektrohemiji, Prirodno-matematički fakultet, Kragujevac, 2015.			
Number of classes per week	**Lectures:** 3	**Practical classes:** 3	
Teaching methods Classical lectures with interactive discussions, laboratory exercises, consultations and preparation of a seminar paper.			
Knowledge evaluation (maximum 100 points)			
Pre-examination obligations	Points	**Final exam**	Points

Lecture attendance		Written part of the final exam	
Exercise attendance		Oral part of the final exam	*50*
Colloquium exam/s		.....	
Term paper	**50**		

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological engineering			
Course: Electrochemical engineering			
Lecturer/s: PhD Marija B. Petrović Mihajlović, associate professor, PhD Milan B. Radovanović, associate profesor, PhD Ana T. Simonović, assistant professor			
Status of the course: Elective course of the Technological Engineering study program			
ECTS: 8			
Prerequisites: Required knowledge of Physical Chemistry and Electrochemistry			
Course goals: 1. To enable the student to calculate electrochemical parameters of technological processes in production; 2. To enable the student for independent literature processing and interpretation of electrochemical (or physico-chemical) data and technological parameters in production processes, which ensures a creative approach in considering and resolving specific cases.			
Learning outcome: To complete the student's theoretical knowledge necessary for the understanding of electrochemical production technologies.			
Course description *Lectures:* The course combines the theoretical aspects of electrochemistry, the phenomena of momentum transfer and mass transfer, and materials science into a single unit necessary for understanding industrial electrochemical processes in order to enable the student scientifically and professionally for their management, improvement and development. Knowledge is also needed to communicate with a qualified working environment and develop a way of thinking and linking facts. *Practice:* *Practice, Other forms of education, Research studies* Calculations and term paper.			
Literature *Recommended:* 1. S. Zečević, S. Gojković, B. Nikolić, Elektrohemijsko inženjerstvo, Tehnološko - metalurški fakultet, Beograd, 2001. *Ancillary:* 1. L.L. Shreir, R.A. Jarman, G.T. Burstein, Corrosion (Volume1)-Metal/Environment Reactions –Third Edition, „Butterworth Heinemann", 2000, Oxford – Auckland Boston - Johannesburg -Melbourne - New Delhi 2. L.L. Shreir, R.A. Jarman, G.T. Burstein, Corrosion (Volume2)- Metal/Environment Reactions –Third Edition, „Butterworth Heinemann", 2000, Oxford – Auckland Boston - Johannesburg -Melbourne - New Delhi 3. W. von Baeckmann, 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 andButterworth Heinemann" are imprints of Elsevier Science, 1999 5. B. N. Popov, Corrosion Engineering: Principles and Solved Problems, Elsevier, Amsterdam, 2015			
Number of classes per week	**Lectures:** 3	**Practical classes:** 3	
Teaching methods Classic lectures with interactive discussions, computational and laboratory exercises and consultations.			
Knowledge evaluation (maximum 100 points)			

Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance		Written part of the final exam	
Exercise attendance		Oral part of the final exam	*50*

Colloquium exam/s		.....	
Term paper	**50**		

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological engineering

Course: Industrial sources of air pollution

Lecturer/s: PhD Snežana M. Šerbula, full professor, PhD Tanja S. Kalinović, assistant professor, PhD Ana A. Radojević, assistant professor

Status of the course: Elective course of the study program Technological Engineering

ECTS: 8

Prerequisites: Basic knowledge in the field of Air pollution and protection and Purification of waste gases.

Course goals:

Getting to know and understanding industrial sources of air pollution.

Learning outcome:

Selection of adequate technological process for partially or complete removal of toxic and carcinogenic substances from industrial gases within the legislative.

Course description

Lectures:

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. Chemical conversion with other compounds. Thermal and catalytic combustion of industrial waste gases. Condensation of the 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 and water based solutions for sorbtion of gas impurities. Removing of sulphur and nitrogen oxides. Membrane processes for gas purification. Various techniques for gas purification.

Practice:

Practice, Other forms of education, Research studies

Creation and processing of individual project.

Literature

Recommended*:*

11. F. Woodard, Industrial Waste Treatment Handbook, Boston Butterworth–Heinemann, 2001.
12. A. Kohl, R. Nielsen, Gas purification; Gulf Publishing Company, Houston, Texsas, 1997.
13. D. Vallero, Fundamentals of Air Pollution, Academic Press, San Diego, 2014.

Ancillary*:*

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	**Lectures:** 3	**Practical classes:** 3

Teaching methods

Interactive teaching and discussion, method of written papers (term paper).

Knowledge evaluation (maximum 100 points)

Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance		Written part of the final exam	
Exercise attendance	**20**	Oral part of the final exam	*30*
Colloquium exam/s		.....	
Term paper	**50**		

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological Engineering			
Course: Theoretical bases of Master's thesis			
Lecturer/s: PhD Jelena M. Djoković, full professor			
Status of the course: Compulsory course of the Technological Engineering study program			
ECTS: 8			
Prerequisites: Passed exams from the first semester			
Course goals The educational goal of this course is to acquire the knowledge needed for defining a research problem, its elaboration, writing and public presentation.			
Learning outcomes The student develops the ability to carry out analysis and identify problems within the given topic and is trained to produce quality master's theses, scientific papers and research projects.			
Course description Introduction. Analysis of the situation in the studied area. Creating work structure. Plan of research activities. Collecting literature. Formulation of the research hypothesis. Theoretical and mathematical analysis of influencing factors. Getting to know the instruments for the necessary measurements. Operational work plan. Data processing. Analysis of results. Discussion. Comparison with the results of other authors. Drawing conclusions. Writing and preparing a public presentation of the master's thesis. Intellectual property in the technical sciences, copyright and patent protection. World-wide scientific research challenges of the 21st century.			
Literature Professional and scientific literature and project documentation related to the chosen topic.			
Number of classes per week	**Lectures:** 2	**Practical classes:** 2	
Teaching methods Theoretical and practical teaching, practical classes, consultation.			
Knowledge evaluation (maximum 100 points)			

Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance	**10**	Written part of the final exam	
Exercise attendance	**50**	Oral part of the final exam	*40*
Colloquium exam/s		.....	
Term paper			

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological engineering			
Course: Professional practice			
Lecturer/s: PhD Snežana M. Milić, full proffesor, PhD Ana T. Simonović, assistant professor			
Status of the course: Compulsory course of the study program Technological Engineering			
ECTS: 6			
Prerequisites: Registered in the second semester			
Course goals 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 technological practice, so that can make the best possible use of the acquired theoretical knowledge in concrete conditions. Preparation for future employment after graduation.			
Learning outcomes Training students for the practical application of previously acquired theoretical and professional knowledge in solving specific practical engineering-technical problems in the chemical industry and environmental protection.			
Course description It is formed for each student specifically in agreement with the management of the company where professional practice is carried out, and in accordance with the needs of the profession for which the student is trained. The professional practice program for each student is drawn up by the teacher in charge - the professional practice coordinator in consultation with other teachers engaged in the study program.			
Literature			
Number of classes per week	**Lectures:**	**Practical classes:**	
Teaching methods Practical work or professional practice in a company or institution is carried out according to a pre-defined program - a task consisting of data collection - measurement and analysis with consultation with experts from the company where the professional practice is carried out and the teacher-coordinator of professional practice. At the end of the professional practice, the student submits to the professional practice coordinator a written diary with a description of the activities and jobs he performed during the professional internship. The teacher - professional practice coordinator confirms with his signature in the index that the student has successfully completed the professional practice, which enables the student to certify the semester with other signatures.			
Knowledge evaluation (maximum 100 points)			
Pre-examination obligations	Points	**Final exam**	Points
Lecture attendance		Written part of the final exam	
Exercise attendance		Oral part of the final exam	
Colloquium exam/s		.....	
Term paper			

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological engineering			
Course: Master Work- SRW research			
Lecturer: All teachers in the study program are potential mentors.			
Status of the course: Compulsory course of the Technological Engineering study program			
ECTS: 4			
Prerequisites: Registered Master's thesis topic			
Master's thesis goal In the Master's thesis, students describe technologies or scientific and professional topics in the field of inorganic chemical technology, environmental protection and narrower professional subjects. The master's thesis can be designed on the basis of data specially collected for these purposes, whereby the data is obtained through experimental work that corresponds to the given topic, under the supervision of a mentor. After that, the obtained data are analyzed and discussed by comparing them with data from the scientific literature. On the other hand, a master's thesis can be based only on the processing of data from scientific literature in order to analyze a certain topic. By searching available scientific and professional databases, students collect information on the given topic. The master's thesis is submitted in written form and defended before a committee of three members. As a rule, the master's thesis is the last exam in the study program.			
Master's thesis outcomes The expected outcomes of the Master's thesis are familiarization with the subject matter and the way to solve it, along with the practical application of the acquired knowledge from the study program, which enables the student to independently solve engineering tasks within the framework of the study program.			
Content of Master's thesis The Master's thesis is a research paper formulated for each student individually, in which he gets acquainted with the research methodology in the field of Technological Engineering. The mentor guides the candidate in his work and provides him with assistance in the entire process of preparation through: choosing the topic of the master's thesis, formulating the title of the thesis, setting the goal of the research work, engineering methods and ways of solving it, approaching the problem, choosing the way to process the problem, collecting, processing, analysis and verification using engineering methods, final design of master thesis.			
Number of classes per week	**Lectures: 0**	**Practice: 0**	
Teaching methods The methods of performing the master thesis consist of a theoretical introduction to the problem and independent laboratory work under the supervision of the teacher. During the preparation of the master's thesis, all necessary research methods will be applied. After the completion of the work and its positive assessment by the mentor, the candidate defends the work orally in front of a three-member committee of teachers.			
Knowledge evaluation (maximum 100 points)			
Pre-examination obligations	Points	**Final exam**	Points
Master thesis - research	**50**	Master thesis - research	*50*

	University of Belgrade **Technical faculty in Bor**	
	Accreditation of study program	
	MASTER ACADEMIC STUDIES	TECHNOLOGICAL ENGINEERING

Study program: Technological Engineering			
Course: MASTER'S THESIS – writing and presentation			
Lecturer: All lecturers in the study program are potential mentors			
Status of the course: Compulsory course for Technological Engineering study program			
ECTS: 4			
Prerequisites: All exams passed and professional practice realised.			
Master's thesis goals In the Master's thesis, students describe technologies or scientific and professional topics in the field of inorganic chemical technology, environmental protection and narrower professional subjects. The master's thesis can be designed on the basis of data specially collected for these purposes, whereby the data is obtained through experimental work that corresponds to the given topic, under the supervision of a mentor. After that, the obtained data are analyzed and discussed by comparing them with data from the scientific literature. On the other hand, a master's thesis can be based only on the processing of data from scientific literature in order to analyze a specific topic. By searching available scientific and professional databases, students collect information on the given topic. The master's thesis is submitted in written form and defended before a committee of three members. As a rule, the master's thesis is the last exam in the study program.			
Master's thesis outcomes The expected outcomes of the Master's thesis are introduction with the subject matter and the way to solve it, along with the practical application of the acquired knowledge from the study program, which enables the student to independently solve engineering tasks within the scope of the study program.			
Content of the Master's thesis After conducting experimental research or reviewing professional literature, the student prepares a master's thesis in the form containing the following chapters: introduction (defining the goal of the task and expected results); theoretical part and review of literature (presentation of the most important theoretical foundations, which represent the basis for the final thesis); experimental, practical part (processing of obtained data), results and discussion (comparison of obtained results), conclusions related to the topic, and a list of used literature. After completing the work, the student submits the work, followed by a public defense. This qualifies the student for independent presentation and defense of acquired engineering knowledge and experience.			
Number of classes per week	**Lectures:** 0	**Practical classes :** 0	
Teaching methods The methods of completing the final paper consist of a theoretical introduction to the problem and independent laboratory work under the supervision of the teacher. During the preparation of the final paper, all necessary research methods will be applied. After the completion of the work and its positive assessment by the mentor, the candidate defends the work orally in front of a three-member committee of teachers.			
Knowledge evaluation (maximum 100 points)			
Pre-examination obligations	Points	**Final exam**	Points
Master's thesis - writing and presentation	**50**	Master's thesis - writing and presentation	*50*