U N I V E R S I T Y O F S P L I T

FACULTY OF CHEMISTRY AND TECHNOLOGY

Professional Study

Materials Protection and Recycling

SPLIT, January, 2014.

GENERAL INFORMATION OF HIGHER EDUCATION INSTITUTION

Name of higher education institution	Faculty of Chemistry and Technology, University of Split
Address	Teslina 10/V, 21000 Split
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GENERAL INFORMATION OF THE STUDY PROGRAMME

Name of the study programme	Materials Protection and Recycling		
Provider of the study programme	Faculty of Chemistry and Technology, University of Split		
Other participants			
Type of study programme	Vocational study programme **x**	University study programme☐	
Level of study programme	Undergraduate **x**	Graduate☐	Integrated☐
	Postgraduate☐	Postgraduate specialist☐	Graduate specialist☐
Academic/vocational title earned at completion of study	Vocational Bachelor of Chemical Engineering		

1. INTRODUCTION

1.1. Reasons for starting the study programme

The development of technical materials, starting from metals and ceramics and progressing to polymers, composite and hybrid materials, forms the basis for the development of the economy, and serves as a prerequisite for introduction of new technologies. Due to increase in demand and extension of application areas, properties of materials are continually improved and modified. Consequently, the value of the materials increases, as well as the value of products manufactured from these materials.

However, as early as in the production stage, and especially during use, such products are exposed to various influences and consequential unintentional harmful changes that decrease their usability, shorten service life and have negative effects on the environment. Therefore, due to technical, economical and environmental significance, it is necessary to prevent, or at least mitigate degradation of materials. Different end-of-life products, constructions and similar are disposed of through recycling, in a manner that is both commercially and environmentally acceptable. Considering the limited nature of natural resources, through material, chemical or energetic recycling of waste, the process resource depletion is detained.

Increasing knowledge on materials contributes to the development of a number of industries, presents a strategic development goal in the Republic of Croatia and is consolidated with the priorities of developed European countries. Furthermore, processing of materials is nowadays taking place mostly in small and medium special-purpose production facilities conformed to environment protection standards. Economy as a whole is in demand of a profile of experts trained for lifelong learning, who are able to adopt and apply new technologies. In this respect, it is necessary to make necessary adjustment in available study programmes.

Through introduction of the professional study programme *Protection and Recycling of Materials*, Faculty of Chemical Technology in Split, as an institution of higher education, aims to provide incentive to economical development and rational management of natural resources. The proposed study programme provides basic engineering knowledge in relation to materials, as well as underpinning knowledge on methods used in quality control and analysis of materials. In addition, knowledge is provided on basic causes of degradation (corrosion, decomposition) of materials and their protection during use. Following the completion of studies, professional bachelors possess skills necessary for involvement in activities related to solving issues of management of various waste materials, thus balancing the relationship between technological development and the environment.

The basic aim and purpose of the study programme is to develop professional skills fundamental for prompt inclusion in the working processes of various industries and small and medium enterprises. Following the completion of studies, employment options include chemical, metal processing, construction, shipbuilding and related industrial facilities, as well as areas of quality assurance and control of final products, management of organic and inorganic waste and other job positions that require expertise and knowledge gained during the course of this study programme.

Due to specific nature of the professional study programme, the only one of this type available in the Republic of Croatia, representation of students from all Croatian regions is anticipated.

1.2. Relationship with the local community (economy, entrepreneurship, civil society, etc.)

With proposal of this study programme, Faculty of Chemistry and Technology responds to the needs of the local community and the University of Split and offers a professional study programme in the field of technical sciences, with focus on protection and recycling of materials, in accordance with the Mediterranean outlook of south Croatia. It should be noted that the proposed study programme is the only one of this type in the country and is not in collision with similar study programmes, either at the University of Split, or in the Republic of Croatia.
The tradition of production and processing of metal, polymers and silicate materials in this region contributed to continuous and permanent education of experts in this area, provided by the Faculty of Chemistry and Technology in Split. Furthermore, ever since it has been established, Faculty of Chemistry and Technology promoted cooperation with the production experts, exchanging theoretical and practical findings in solving specific issues related to production and use of materials. At present, when large industrial facilities are mostly closed, the education of qualified experts serves to support technological development through small and medium enterprises, with skilled experts in the field of chemical engineering performing management and professional tasks. In this manner, significant contribution can be made towards increasing competitiveness of Croatian economy in the region and Europe.

1.3. Compatibility with requirements of professional organizations

Professional study programme Protection and Recycling of Materials has been consolidated with the recommendations of the Croatian Society for Materials Protection, Society of Plastics and Rubber Engineers, as well as the Croatian Society of Chemical Engineers. The study programme pays regard to the specific features of the local community and the region as a whole, emphasises the importance of staff training in the fields of corrosion and degradation protection and protection control, as well as waste management, with a special focus on recycling of materials.
The Association of Former Students and Friends of Faculty of Chemistry and Technology (ALUMNI), active organization formed at the Faculty, also supports development of this study programme.

1.4. Name possible partners outside the higher education system that expressed interest in the study programme

Potential partners outside higher education system that have expressed interest in the professional study programme Protection and Recycling of Materials are business enterprises and public institutions in the Split-Dalmatia County and wider region: AD plastik, Brodosplit, Omial, Cemex, Kalun, Adriacink, Adriachem, Vodovod i kanalizacija (Water supply and sewage services), Ingatest and other county and municipal inspection services.
Some of the stated institutions are willing to serve as teaching centers and provide assistance using available equipment, i.e. have expressed will to cooperate by offering field work courses and practical courses in their facilities.

1.5. Financing

The planned source of financing for the professional study programme Protection and Recycling of Materials is the Ministry of Science, Education and Sports. The Faculty of

Chemistry and Technology currently offers professional study programme in Chemical Technology with two major fields of study: Chemical Technology and Materials and Food Technology. The study programme is fully financed by the Ministry of Science, Education and Sports.
Admissions quotas for those study programmes are 20 students (Chemical Technology and Materials) and 30 students (Food Technology). With introduction of the study programme Protection and Recycling of Materials, the existing professional study programme would be terminated; therefore the introduction of the new programme would not require any additional funds.

1.6. Comparability of the study programme with other accredited programmes in higher education institutions in the Republic of Croatia and EU countries

The professional study programme is to a certain extent comparable with the study programmes of distinguished European higher education institutions and institutions of higher education in neighbouring countries, such as:

- Politecnico di Torino, Italy (https://didattica.polito.it/pls/portal30/gap.a_mds.init),
- Politecnico di Milano, Italy ((http://www.polinternational.polimi.it/index.php?id=197&uid=314&k_cf=31&k_corso_la=347&aa=2011)
- University of Maribor, Slovenia (http://www.fkkt.uni-lj.si/en/?2286),
- University of Pardubice, Czech Republic (http://www.upce.cz/en/fcht/uechi.html),
- Politechnika Warszawska, Poland (http://www.ichip.pw.edu.pl/)

1.7. Openness of the study programme to student mobility (horizontal, vertical in the Republic of Croatia, and international)

The proposed professional study programme and its comparability with similar study programmes in the Republic of Croatia and EU countries enable student mobility, as well as faculty/staff mobility. Mobility shall be realized through attendance of individual courses from other professional study programmes, or attendance of entire semester at the related study programme and through completion of the final thesis. Students will have the option to enrol a specific number of courses in other fields of study. The study programmes included in the mobility scheme are offered by the constituents of the University of Split, other Croatian universities and colleges, i.e. specific higher education institutions in the European Union.

1.8. Compatibility of the study programme with the University mission and the strategy of the proposer, as well as with the strategy statement of the network of higher education institutions

Preparation of this study programme is in accordance with mission, vision and goals that are partly related to the University of Split Scientific Strategy 2009-2014, encouraging the university constituents to create their own internal development plans. The proposed study programme Protection and Recycling of Materials is the only one of this type at the University of Split and in the wider region.
The proposed professional study programme is in agreement with the Faculty of Chemistry and Technology Development Strategy 2008 – 2013, namely through: **Strategic aim 1 –** Reform of study programmes; **Task 1.1. –** Maintain and achieve effective ratio of different study programmes and modules (*Indicator 1.1a* – Number of accredited study programmes

and modules); **Task 1.2.** – Consolidate the ratio of a number of students at professional and university study programmes with labour market demands (*Indicator 1.2a* – Number of accredited study programmes and modules).
In order to increase recognition of study programmes and adequately address the needs of a modern economy, Faculty of Chemistry and Technology undertook reforms of the existing study programmes, including the professional study programme in chemical technology. In accordance with the Bologna Process, since academic year 2005/06 the Faculty has offered courses in two major fields of study, Chemical Technology and Materials and Food Technology, as a part of the professional study programme in Chemical Technology. The duration of the study programme is 2.5 years (5 semesters; 150 ECTS points).
The field of study Chemical Technology and Materials needs to be consolidated with the demands of a modern economy and labour market, as well as the concept of higher education, by giving the option to continue studies at an advanced level.

1.9. Current experiences in equivalent or similar study programmes

Faculty of Chemistry and Technology has had a few decade experiences in professional study in chemical technology, such as processing and application of polymers and chemical technology and materials. More than 320 students have been completed those studies.

2. DESCRIPTION OF THE STUDY PROGRAMME

2.1. General information

Scientific/artistic area of the study programme	Chemical engineering
Duration of the study programme	3 years (6 semesters)
The minimum number of ECTS required for completion of study	180
Enrolment requirements and admission procedure	Completed 4-year secondary school and secondary school leaving exam.

2.2. Learning outcomes of the study programme (name 15-30 learning outcomes)

Professional bachelor of chemical engineering would be able to:

- apply basic knowledge of mathematics, physics and chemistry
- work in laboratory on professional and safe manner
- analyze and present the results of measurements in laboratory or plant facility using PC
- explain basic physical and chemical properties of pure substances and methods of their determination
- explain basic mechanism of matter and energy transfer
- apply appropriate unit operation
- recognize types and construction of chemical reactors and the area of their application
- recognize the processes of materials production (polymers, metals, binders…)
- diminish negative impact on the environment during materials manufacture and processing
- prepare processing water and adequately manage the waste waters
- routinely work with equipment for identification and characterization of materials
- recognize the causes of materials corrosion and degradation
- apply different methods of materials protection against corrosion
- recognize types of waste and their impact on the environment
- suggest the appropriate process of waste materials management
- work independently on relatively simple procedures of materials reuse recycling
- apply the knowledge of chemical engineering on the environmental protection
- estimate the economical values of materials protection against corrosion and degradation
- estimate the economical values of materials recycling procedures.

2.3. Employment possibilities

- Brodosplit, Split
- AD plastik, Split
- Omial, Omiš
- Cemex, Kaštel Sućurac
- Adriacink, Split

- Vodovod i kanalizacija, Split
- TOF, Drniš
- ALPRO ATT, Trogir

2.4. Possibilities of continuing studies at a higher level

Higher level studies are possible at the corresponding graduated studies in Croatia and abroad as well.

2.5. Name lover level studies of the proposer or other institutions that qualify for admission to the proposed study

Not applicable.

2.6. Structure of the study

STUDY PROGRAMME STRUCTURE
Within the structure of the undergraduate study programme Protection and Recycling of Materials, core courses are placed in the first four semesters, while the fifth and sixth semesters contain core and elective courses. With the aim of continuous improvement of the programme, updating of core and elective courses can be achieved by adding new ones. A new course is proposed by the professor to the Teaching Committee which has the authority to act towards the Faculty Council of Faculty of Chemistry and Technology. Following the second year of study, students take practical courses. The study programme is completed after passing all the exams and drafting and defending the final thesis.
ECTS
All courses are one-semester courses, carrying an appropriate number of ECTS credits. During the evaluation of ECTS credits, objective course workload and course professor estimate was taken into account. In case of subjects that are shared with the existing study programmes, the results of a student survey on awarding ECTS credits was also taken into consideration.

2.7. Guiding and tutoring through the study system

With the aim of providing advice, information and guidance to students during the course of study, the Faculty Council of Faculty of Chemistry and Technology appoints the head of study for student groups at each year of study.

2.8. List of courses that the student can take in other study programmes

With the aim of continuing and extending their education, and strengthening and supporting professional training, especially in the context of raising awareness on the interrelation between faculties and universities, students may take courses from other study programmes that offer courses that relate or overlap with the topic of interest of this study programme. The procedure for selecting courses from other faculties is defined in the *Ordinance on study programmes and course attendance system at the Faculty of Chemistry and Technology in Split.*

2.9. List of courses offered in a foreign language as well (name which language)

As a rule, the lectures and courses held at the study programme Protection and Recycling of Materials shall be provided in Croatian language. Since there are courses included in the programme that are proposed to be taught in English, as necessary these courses will be provided in English.

2.10. Criteria and conditions for transferring the ECTS credits

The criteria and requirements for the transfer of ECTS credits are regulated by the *Ordinance on study programmes and course attendance system at the University of Split, Statute of the Faculty of Chemistry and Technology in Split* and *Ordinance on study programmes and course attendance system at the Faculty of Chemistry and Technology in Split.*

2.11. Completion of study

Final requirement for completion of study	Final thesis **x** Diploma thesis ☐	Final exam ☐ Diploma exam ☐
Requirements for final/diploma thesis or final/diploma/exam	Requirements for final thesis are regulated by the *Ordinance on study programmes and course attendance system at the Faculty of Chemistry and Technology in Split.*	
Procedure of evaluation of final/diploma exam and evaluation and defence of final/diploma thesis	Procedure of evaluation of final/diploma exam is regulated by the *Ordinance on final thesis/diploma thesis at the Faculty of Chemistry and Technology in Split.*	

2.12. List of mandatory and elective courses

List of courses							
Year of study: 1st							
Semester: 1st							
STATUS	CODE	COURSE	HOURS IN SEMESTER				ECTS
			L	S	E	F	
Mandatory	KTL101	General and inorganic chemistry	30	15	30		7.0
	KTL102	Chemical calculus	15	30			4.0
	KTL103	Mathematics	30	45			8.0
	KTL104	Physics	30	15	30		7.0
	KTL105	Computers application	15		30		4.0
	Total		120	105	90		30

List of courses							
Year of study: 1st							
Semester: 2nd							
STATUS	CODE	COURSE	HOURS IN SEMESTER				ECTS
			L	S	E	F	
Mandatory	KTL106	Analytical chemistry	30	15	45		8.0
	KTL107	Fundamentals of organic chemistry	30	15	30		7.0
	KTL108	Fundamentals of physical chemistry	30	15	30		7.0
	KTL109	Safety at work	30		15		4.0
	KTL110	Fundaments of mechanical structures	15	15			4.0
	Total		135	60	120		30

List of courses							
Year of study: 2nd							
Semester: 3rd							
STATUS	CODE	COURSE	HOURS IN SEMESTER				ECTS
			L	S	E	F	
Mandatory	KTL201	Thermodynamics and thermotechnics	30	15	15		6.0
	KTL202	Unit operations	30	15	25	5	8.0
	KTL203	Electrochemical engineering	30		30		5.5
	KTL204	Chemical reactors	30		15		5.0
	KTL205	Metal construction materials	30		20	10	5.5
	Total		150	30	105	15	30

List of courses							
Year of study: 2nd							
Semester: 4th							
STATUS	CODE	COURSE	HOURS IN SEMESTER				ECTS
			L	S	E	F	
Mandatory	KTL206	Measuring and control technigue	30		30		5.0
	KTL207	Polymerization processes	30		30		5.0
	KTL208	Materials in the construction engineering	30		30		5.0
	KTL209	Corrosion and metals protection	30		30		5.0
	KTL210	Technology of the pretreatment of raw water	30		30		5.0
	KTLOSP	Practical work in companies, public or private institutions					5.0
	Total						30

List of courses							
Year of study: 3rd							
Semester: 5th							
STATUS	CODE	COURSE	HOURS IN SEMESTER				ECTS
			L	S	E	F	
Mandatory	KTL301	Methods for identification of materials	30		30		6.0
	KTL302	Polymeric materials	30		25	5	6.0
	KTL303	Industrial wastewaters	30	15	27	3	6.0
	KTL304	Coatings	30		25	5	6.0
	KTL305	Durability of non-metallic materials	30		26	4	6.0
	Total		150	15	133	17	30

List of courses							
Year of study: 3rd							
Semester: 6th							
STATUS	CODE	COURSE	HOURS IN SEMESTER				ECTS
			L	S	E	F	
Mandatory	KTL306	Solid waste and recycling	30		10	5	5.0
	KTL307	Processing and recycling of polymers	30		15	15	6.0
	KTLOZR	Final Thesis					7.0
	Total						18.0
Elective	KTL308	Composite materials	30		15		4.0
	KTK316	Mineral raw materials from seawater	30		10	5	4.0
	KTL310	Technology and treatment of aluminium	30		12	3	4.0
	KTL311	Water protection	30		13	2	4.0
	KTL312	Industrial waste	30		12	3	4.0
	KTL313	Environmental engineering	30		10	5	4.0
	KTL314	Introduction to entrepreneurship	30	15			4.0
	* Minimum ECTS credits need to be obtained from elective courses are 12.						

2.13. Course description

General and inorganic chemistry

NAME OF THE COURSE	General and inorganic chemsitry					
Code	KTL101	Year of study	1.			
Course teacher	Marijo Buzuk	Credits (ECTS)	7.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30	15	30	
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	This course provides an introduction to chemistry as a quantitative and qualitative science. The course will provide students with the core chemistry skills and knowledge recommended for understanding of other fields of chemistry (organic, analytic, physics) and will provide knowledge needed for engineering study. Course will present fundamental concepts of chemistry including atomic structure, history of the atom, development of the periodic table, nuclear chemistry, chemical nomenclature and formula, types of reactions, stoichiometry, gas laws, liquids and solids, thermodynamics, chemical equilibrium, acids and bases. Core topics include base theories in chemistry needed for understanding and recognizing problems in chemistry and provide the student with a basic foundation of laboratory inquiry and develop problem solving skills.					
Course enrolment requirements and entry competences required for the course						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students successfully completing this course will: 1. Understand and apply concepts to solve problems by knowledge of the matter and measurement and atoms, molecules and ions. 2. Describe and calculate quantities for gas behaviour, stoichiometry and calculations with chemical formulas and equations, reactions in aqueous solution. 3. Use the following to predict, depict and describe electronic structure of atoms, elemental periodic properties, basic properties of chemical bonding, molecular geometry and theory of bonding. 4. Understand and apply concepts to solve problems using knowledge of properties of solutions and chemical kinetics. 5. Describe and calculate quantities for general chemical equilibria, acid-base equilibria, precipitation equilibria.					
Course content broken down in detail by weekly class schedule (syllabus)	1. Introduction to chemistry and matter and mathematics of chemistry. Physical and chemical properties of the matter. 2. Dalton`s theory of atom. Gases and their laws. Molar mass of molecules. 3. Atoms, the atomic theory and structure. 4. The periodic law, properties, and trends. 5. Compounds, bonding, ionic and covalent bonding, formula, nomenclature. Geometry of molecules. Lewis structure. 6. Intermolecular forces and interactions. 7. Chemical reactions, redox reactions, oxidation and reduction.					

	8. Solution chemistry. Properties and kind of solutions. Electrolytes. 9. Collligative properties. Henry`s and Rault`s law. Dissolution of gasses in liquids. 10. Chemical equilibrium. Heterogonous and homogenous equilibrium. Acid-base equilibrium. Buffers. pH. 11. Elements of 18. and 17. group. Hydrogen and water. 12. p-elements. Elements of 16. i 15. group. Characteristic reaction. Characteristic compounds and oxidation number. Water. Water hardness. Acid and basic oxides. 13. p-elements. Elements of 14. i 13. group. Carbonates, hydrogencarbonates. Aluminium-amphoteric properties of aluminium and its oxides. 14. s-elements. Elements of 1. and 2. group. Hydrides and oxides. Peroxides, superoxides, oxides. Basic character of s-elements and their compounds. 15. Overview.
Format of instruction	× lectures × seminars and workshops □ exercises □ *on line*in entirety □ partial e-learning □ field work □ independent assignments □ multimedia × laboratory □ work with mentor ☐(other)
Student responsibilities	Attendance to all lab courses.

Screening student work*(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2.0	Research		Practical training	
	Experimental work	1.0	Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	1.0	Oral exam	2.0	(Other)	
	Written exam	1.0	Project		(Other)	

Grading and evaluating student work in class and at the final exam	During semester two exams will be performed. Final examinations will be administered during formal examination periods. The following percentage equivalents apply to final grade: <55% Failure; 56%-66% (2); 67%-78% (3); 79%-90% (4);> 90% (5). After written exam, student will attend to oral exam. Lecturers do not give grades. Students earn grades.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Filipović, I., Lipanović, S., Opća i anorganska kemija I i II dio, Školska knjiga, Zagreb, 1995		
	Sikirica, M., Stehiometrija, Školska knjiga, Zagreb		
	Vježbe iz Opće kemije (interna skripta), Kemijsko-tehnološki fakultet, Split, 2013.		

Optional literature (at the time of submission of study programme proposal)	Darrell D. Ebbing and Steven D. Gammon, General Chemistry, 9th edition, Houghton Mifflin Company, Boston, 2009. Raymond Chang, Chemistry, 10th edition, McGraw-Hill, New York, 2010.
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University
Other (as the proposer wishes to add)	

Chemical Calculus

NAME OF THE COURSE	Chemical Calculus					
Code	KTL102	Year of study	1.			
Course teacher	Marijo Buzuk	Credits (ECTS)	4.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			15	30		
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	Getting insight to problems that involve quantitative relationships between reactants and products during chemical reactions.					
Course enrolment requirements and entry competences required for the course						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	1) Understanding of concept of mole and analyzing a problems involves quantitative relationship by mole method. 2) Understanding of losses and gain in chemical calculus. 3) Understanding of homogenous and heterogeneous chemical reaction that involves gases. 4) Solving problems that include preparation and determination of different solutions composition.					
Course content broken down in detail by weekly class schedule (syllabus)	Lecture 1: Quantitative relationship in chemistry. Definition of mole. The Law of conservation of mass. Lecture 2: Mass fraction. Calculation of the mass of one element to the total mass of a compound. Calculation of the mass of pure compound to the total mass of a mixture. Lecture 3: Losses during chemical reactions. Theoretical and practical quantity of products. Lecture 4: Limiting reactant. Determination of limiting reactant and its influence on product amount. Lecture 5: Losses of limiting reactant. Redundant reactant. Losses of redundant reactant. Lecture 6: Resolving of complex problems including above mentioned lectures. Lecture 7: Resolving of complex problems including above mentioned lectures. Lecture 8: Stoichiometry involves gases. Ideal gas law. Volume relationship during chemical reaction. Lecture 9: Heterogeneous chemical reaction including gases, liquid and solids. Lecture 10: Chemical calculus in solution chemistry. Lectures 11: Fractions and ratio (mole, mass, volume) in chemical calculus. Lectures 12: Concentrations (mole, volume, mass) in chemical calculus. Lectures 13: Molality and concentrations in chemical calculus. Lectures 14: Preparation of solution. Determination of solution composition. Lectures 15: Mixing of solution with different composition. Diluting and concentrating of solutions.					

Format of instruction	× lectures × seminars and workshops □ exercises □ *on line*in entirety □ partial e-learning □ field work			□ independent assignments □ multimedia □ laboratory □ work with mentor □(other)		
Student responsibilities						
Screening student work*(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	0.5	Research		Practical training	
	Experimental work		Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	1.5	Oral exam		(Other)	
	Written exam	2.0	Project		(Other)	
Grading and evaluating student work in class and at the final exam	During semester two exams will be performed. Final examinations will be administered during formal examination periods. The following percentage equivalents apply to final grade: <55% Failure; 56%-66% (2); 67%-78% (3); 79%-90% (4);> 90% (5). Lecturers do not give grades. Students earn grades.					

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	B. Perić, Kemijsko računanje, HDKI/Kemija u industriji, Zagreb, 2006.	10	
	M. Sikirica, Stehiometrija, Školska knjiga, Zagreb, 2001.	10	

Optional literature (at the time of submission of study programme proposal)	I. Filipović, S. Lipanović, Opća i anorganska kemija I. dio, Školska knjiga, Zagreb, 1995
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University
Other (as the proposer wishes to add)	

Mathematics

NAME OF THE COURSE	**Mathematics**						
Code	KTL103	Year of study	1.				
Course teacher	Branka Gotovac	Credits (ECTS)	8.0				
Associate teachers		Type of instruction	L	S	E	F	

		(number of hours)	30	45		
Status of the course	Mandatory	Percentage of application of e-learning				

COURSE DESCRIPTION

Course objectives	To introduce students to the basic elements of calculus and linear algebra.
Course enrolment requirements and entry competences required for the course	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After finishing this course the student is expected to: • identify and sketch graphs of elementary functions, to determine the domains of more complex functions • find the derivatives of the given functions • know the graphical applications of the dervative (tangents and normals, maximum, minimum and inflection points, sketching and interpreting graphs) • know techniques of integration (integration by substitution, integration by parts) • use the definite integral -applications to geometry • solve the system of linear equations (by matrix inversion, by Gaussian elimination)
Course content broken down in detail by weekly class schedule (syllabus)	1. Sets: Notion. Algebra of sets. 2. Number sets. 3. Functions: Notion. Inverse function. 4. Elementary functions. Limits. 5. Continuity. Sequences: Notion. Limits. 6. Derivative and application: Notion. Interpretation. Derivation techniques. 7. Differential. Higher order derivatives. 8. Theorems of differential calculus. Maximum, minimum points. 9. Inflection points. Asymptotes. Curve sketching. 10. Integral and application: Indefinite integral. Techniques of integration. 11. Definite integral. 12. Using the definite integral. 13. Matrices and vectors: Matrix algebra. Determinants. Inverse matrix. 14. Linear systems of equations. Vector algebra. 15. Course review. Revision.
Format of instruction	✕ (lectures) ✕ (seminars and workshops ☐exercises ☐on linein entirety ☐partial e-learning ☐field work ☐independent assignments ✕multimedia ☐laboratory ☐work with mentor ☐(other)
Studentresponsibilities	Regular attendance of classes.

Screening student work*(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	3.0	Research		Practical training	
	Experimental work		Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	2.0	Oral exam	1.5	(Other)	
	Written exam	1.5	Project		(Other)	

<table>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td>Taking exams: during classes (1.) and after classes, in examination schedules (2.).
1.
<table><tr><td></td><td>points</td><td>condition</td></tr><tr><td>tests</td><td>3x30</td><td>39</td></tr><tr><td>activity</td><td>10</td><td></td></tr><tr><td>total</td><td>100</td><td>46</td></tr></table>2.
Students have to pass an oral exam after passing the written exam (at least 50% of the total number of points).</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>T. Bradić, i dr., Matematika za tehnološke fakultete, Element, Zagreb (više izdanja)</td><td>47</td><td></td></tr>
<tr><td>B.P. Demidovič, Zadaci i riješeni primjeri iz više matematike, Tehnička knjiga, Zagreb (više izdanja)</td><td>5</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">S. Kurepa, Matematička analiza I i II dio, Školska knjiga, Zagreb, 1997.
I. Slapničar, Matematika 1, Fakultet elektrotehnike, strojarstva i brodogradnje u Splitu, Sveučilište u Splitu, Split, 2002. (http://lavica.fesb.hr/mat1)
I. Slapničar, Matematika 2, Fakultet elektrotehnike, strojarstva i brodogradnje Sveučilišta u Splitu, Split, 2008. (http://lavica.fesb.hr/mat2)
Hughes-Hallett, Gleason et al., Calculus, John Wiley and Sons, Inc., New York, 2000.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

Physics

<table>
<tr><td>COURSE NAME</td><td colspan="2">Physics</td><td colspan="5"></td></tr>
<tr><td>Code</td><td>KTL104</td><td>Year of study</td><td colspan="5">1.</td></tr>
<tr><td>Course teacher</td><td>Mirko Marušić</td><td>Credits (ECTS)</td><td colspan="5">7.0</td></tr>
<tr><td rowspan="2">Assistants</td><td rowspan="2"></td><td rowspan="2">Type of instruction</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>30</td><td>15</td><td>30</td><td></td></tr>
<tr><td>Course status</td><td>Mandatory</td><td>Application of e-learning (percentage)</td><td colspan="5"></td></tr>
<tr><td colspan="7">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="6">Acquiring theoretical knowledge and developing the ability to differentiate properties and concepts of classical and modern physics. Creating an adequate attitude towards interpreting physical phenomena and their applications. Mastering the scientific physical approach to experimental observations and methods required in</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">the physical laboratory.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="2">none</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="2">After passing the exam the student is expected to:
know basic physical measures and units of measure,
understand properties of motion and forces in the classical theory,
be able to identify the characteristics of the exact approach the micro world phenomena,
understand basic principles of electricity and magnetism, as well as the wave properties of electromagnetic radiation,
be able to describe the phenomena associated with the dual nature of light,
understand principles of geometrical and physical optics,
have basic knowledge of modern physics,
be able to apply the acquired knowledge to problem-solving tasks,
be able to use the methods of measuring the chosen physical measures and carry our experiments autonomously,
have developed the skill of graphic processing of measured data and the skill of writing reports on the experiment conducted and results obtained.</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="2">1st week: Motion and Forces
2nd week: Energy and Work
3rd week: Systems of particles. Rotation.
4th week: Elasticity. Oscillation. Elastic waves.
5th week: Partial assessment (1st preliminary test)
6th week: Molecular-kinetic theory. Heat.
7th week: Fluids. Transport phenomena.
8th week: Electrostatics and Magnetostatics
9th week: Electromagnetism. Electric Current and Electric Circuits.
10th week: Partial assessment (2nd preliminary test)
11th week: Electromagnetic Waves. Light. Geometrical Optics. Optical instruments.
12th week: Physical Optics.
13th week: Elements of Quantum mechanics.
14th week: Laser Light. Radioactivity.
15th week: Partial assessment (3rd preliminary test)
Seminars: Exercises on selected topics (40 - 60 exercises)
Seminars for advanced students on the topics of physics in engineering.
Exercises:
Measuring of the basic physical quantities. Taking basic physical measures. Numerical and graphical processing of the measured data. Measurement errors. Torque and moment of inertia. Conservation of energy. Oscillators. Heat capacity. The laws of hydrostatics. Surface phenomena. Electrical circuits. The laws of geometrical optics. The phenomena of physical optics and their applications. Spectroscopy.</td></tr>
<tr><td>Format of instruction</td><td>X lectures
☐seminars and workshops
X exercises
☐ entirely on line
☐blended learning</td><td>☐independent assignments
X multimedia
X laboratory
☐work with mentor
X group and individual tutorials</td></tr>
</table>

	☐field work		X seminars			
Student responsibilities						
Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1.0	Research		Practical training	
	Experimental work	1.4	Report		Pre-test preparation classes	0.6
	Essay		Seminar essay		(Other)	
	Tests	1.4	Oral exam	1.3	(Other)	
	Written exam	1.3	Project		(Other)	

Grading and evaluating student work in class and at the final exam	In course of the semester, the entire exam can be passes by taking and passing the three preliminary tests consisting of theoretical questions as well as practical exercises and 10 laboratory tests. In the examination periods first written and then oral exam is taken. Grades: 55-64% - sufficient; 65-79% - good, 80-89% - very good; 90-100% - excellent.		
Required literature (available in the library and via other media)	**Book title**	**Number of books in the library**	**Available via other media**
	Janko Herak, Osnove kemijske fizike, Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu, 2001.	10	-
	P. Kulišić, L.Bistričić, D. Horvat, Z. Narančić, T. Petrović i D. Pevec. Riješeni zadaci iz mehanike i topline. Školska knjiga, Zagreb, 2002.	10	-
	E. Babić, R. Krsnik, M. Očko, Zbirka riješenih zadataka iz fizike, Školska knjiga Zagreb, Zagreb, 1990.	10	-
Optional literature	D. Halliday, R. Resnick, Fundamentals of Physics, John Wiley, New York, 2003.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Computers application

NAME OF THE COURSE	**Computer application**					
Code	KTL105	Year of study	1.			
Course teacher	Dražan Jozić	Credits (ECTS)	4.0			
Associate teachers		Type of instruction	L	S	E	F

		(number of hours)	15		30	
Status of the course	Mandatory	Percentage of application of e-learning				

COURSE DESCRIPTION

Course objectives	Acquiring a basic knowledge of computers and computer systems. Knowledge about the use of Internet content and protect your computer from malicious programs. Basic skills about the content management (folders and files) on PCs using the Windows operating system. Basic skills using programs offered in the MS Office software.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student will be able to: 1. Manage content on PC computer (files and folders) 2. Use the MS Word in the purpose of the editing the file according to the specified requirements (defining the shape and page layout, inserting the images, finished elements, tables, graphs ...) 3. Use the MS Excel for analysis, calculation, sorting, graphical presentation and format tables. 4. Use the MS PowerPoint to create presentations 5. Set up and use MS Outlook for editing and emailing 6. Find reliable sources of information on the Internet		
Course content broken down in detail by weekly class schedule (syllabus)	1. Week	L	General information about the course and mode of examination, Introduction to computers application, Information activity and technology, Computerization, Computer applications in Chemistry and Chemical Engineering
		E	
	2. Week	L	Hardware (PC), Von Neumann's model computers, Computer hardware, Computer types, Basic terms in the Computer Engineering and informatics, Basic parts (components) of the PC, Central processing unit (CPU), Computer memory, Motherboards and connectors, Input and Output devices
		E	
	3. Week	L	Operating systems and applications, The BIOS (Basic Input / Output System), Preparing disks and drives for installation of the OS, File system (FAT, NTFS), Computer Programs, System programs, Application programs, Operating systems
		E	
	4. Week	L	Basics commands for MS-DOS, GUI (Graphical User Interface), Properties GUI, History of developing the MS Windows OS, Example Installations operating systems (Windows OS), Customizing the User Interface, Library, Customize settings on PC computer, Firewall, Windows Defender, Windows Update, Action Center, Commercial antivirus programs
		E	
	5. Week	L	Backup and Restore, Control Panel, Customize the computer, The Device Manager, Accounts, Network and Sharing Center, Troubleshooting, Personalization, BitLocker Drive Encryption, Region and Language, Programs and Features, Installing and uninstalling programs, Display, Devices and Printers, Default Programs, Help and

			Support, Accessories and system tools, Shortcuts in Window OS, Changing the language of Windows OS
		E	
	6. Week	L	Malicious software (malware), Computer viruses, Computer worms, Trojan horses, Logic bombs, Spyware, Advertising Programs (Adware), INTERNET, History of the Internet, TCP / IP protocol
		E	
	7. Week	L	First test
		E	
	8. Week	L	Internet, Computer network and classification networks, Internet protocols: HTTP, HTTPS and FTP, Web browsers, Copyright Law
		E	
	9. Week	L	MS Office, MS Word, How to start the MS Word, Layout MS Word window, The status bar, Tabs and tools, Copy and paste data, Special characters, Styles, Tabs, Sections, Creating a new document, Copy text, Headers and footers, Page numbers
		E	MS Word: How to insert and edit the text and its formatting. Paragraph formatting. Lists of lists. Working with documents. formatting documents
	10.Week	L	How to insert and edit the formulas and equations, Application of the finished style characteristics, Input tables and formatting, input images in the document, the entry of bibliographic data entry page breaks and section breaks (define different sections of the document), display the contents of the document
		E	MS Word: Insert pictures, tables and SmartArt elements in the document. Formatting headers and footers document. Entering references and footnotes in the document. Insert the page break, Section break, Application of different style for document
	11.Week	L	MS Excel, How to start MS Excel, Layout MS Excel windows, Toolbar for quick access, Status bar, Tabs and tools, Tabs formulas, Editing data within a worksheet, Graphic data presentation, Input data string in the table, Add the trend data, Sorting data set
		E	MS Excel: Working with the tables. Entering data into tables and data formatting. Entering a series of data. Entering data from different files. Displaying data graphically.
	12.Week	L	Conditional Formatting Data, Creating and deleting equations, Addresses cells (relative, absolute, mixed), Types of functions, Logical operators, Boolean functions, Examples of application functions (IF, AND, OR, COUNTIF ..), MS PowerPoint, MS PowerPoint Startup, The appearance of windows, tabs and tools, Creating presentations, add themes, Themes Edit, Insert object (images, tables, links, media content ...)
		E	MS Excel: Data processing, Calculating with tables, Input and syntax for creating mathematical equations. Showing the trend curve.
	13.Week	L	MS Outlook, MS Outlook Startup, The appearance of windows, tabs and tools, Creating a user account , Creating a new e-mail
		E	MS Power Point: Creating presentations. Choosing the design, How to make redesign of an existing template.
	14.Week	L	Databases, What databases they are?, Fields in databases, How databases are developed?, Center for online databases,

			Bibliographic databases, Citation databases, Databases with full-text, Sciencedirect databases, Scopus databases, Web database, Bibliography
		E	
	15.Week	L	Second Test
		E	

Format of instruction	x lectures □ seminars and workshops x exercises □ *on line*in entirety □ partial e-learning □ field work	□ independent assignments x multimedia □ laboratory □ work with mentor ☐(other)
Studentresponsibilities	Class attendance in the amount of 70% to 100%, and to experimental work of 100% from total hours.	

Screening student work*(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	0.5	Research		Practical training	1.0
	Experimental work		Report		Independent work	0.6
	Essay		Seminar essay		Consultations	
	Tests	0.5	Oral exam		Practical part of exam	0.8
	Written exam	0.6	Project		(Other)	

Grading and evaluating student work in class and at the final exam	The written exam can be finished over the two tests during the semester. Minimum for successful tests is the limit of the 60% resolved test. Each test in assessing participates with a share of the 15% of the final grade. Presence at lectures 70-100% participates with a share of the 5% of the final grade while the presence of the laboratory exercises from 100% participates with a share of the 15% of the final grade. Practical part of exam participates with a share of the 50% of the final grade. The examination periods there is a written and oral exam. Minimum for successful written exam is the limit of the 60% resolved test. Passing one test (previous activity) is valuable in the summer semester examination period with a share of the 20% of the final grade. Written exam has a share of the 20% and practical part of exam has a share of the 40% of the final grade. Students who have not passed any tests during the semester they take the examination through written and practical exams in the regular examination period. Minimum for successful tests the limit of the 50% resolved test. Written part of exam participates with a share of the 30% of the final grade and practical part of exam with a share of the 50% of the final grade. The final grade: 50%-61% - sufficient, 62%-74% - good, 75%-87% very good, 88%-100% - excellent.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	1. D.Jozić, Predavanja iz kolegija:Primjena računala, Kemijsko-tehnološki fakultet, Interna skripta, Split, 2013.	1	
	2. Wallace Wang, Office 2010 For Dummies, Wiley Publishing Inc., Indiana, 2010.	1	

Optional literature (at the time of submission of study programme proposal)	Selected articles from journals recommended by lecturer
Quality assurance	- monitoring of students suggestions and reactions during semester

methods that ensure the acquisition of exit competences	- students evaluation organized by University
Other (as the proposer wishes to add)	

Analytical chemistry

NAME OF THE COURSE	Analytical chemistry					
Code	KTL106	Year of study	1.			
Course teacher	Josipa Giljanović	Credits (ECTS)	8.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30	15	45	
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	Acquiring basic basic theoretical knowledge of analytical chemistry, the role and application of analytical chemistry in various fields					
Course enrolment requirements and entry competences required for the course	Completing the course: General chemistry					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After completing the course, the student will will be able to - Define the concept of analytical chemistry - Differentiate between the concepts of qualitative and quantitative chemical analysis - Understand the concept of quantitative chemical reactions - Understand the concept of gravimetric and volumetric determination - Understand the precipitation, neutralization, complexometric and redox titrations - Solving numerical problems from a qualitative and quantitative chemical analysis					
Course content broken down in detail by weekly class schedule (syllabus)	First week : Description and review of curriculum. Definitions of analytical chemistry. Division of Analytical Chemistry. The concept of the analytical signal. Seminar: Solving numerical problems from theoretical lecture Second week : The concept and definition of chemical analysis - qualitative and quantitative. Seminar: Solving numerical problems; homogeneous and heterogeneous equilibrium in analytical chemistry.. 3rd week : Qualitative chemical analysis. The concept and definition of acids and bases. Consideration of acid-base balance. Seminar: Solving problems .4th week : The concept and definition of complex ions., complexometric equilibrium . Seminar: Solving problems 5th week : The concept and definition of electrochemical reactions. Consideration of electrochemical equilibrium. Seminar: Solving problems					

<table>
<tr><td></td><td colspan="6">6th week: The concept and definition of heterogeneous equilibrium. process of dissolution and precipitation. Seminar: Solving problemsl
7th week .Recapitulation of theoretical and seminars lecture I partial exam .theoretical lecture and seminars
8th week . Quantitative chemical analysis. The concept and definition of gravimetric determination. Seminar: Solving problems,
9th week . Optimization of precipitationcondition. Seminar: Solving problems.
10th week : The concept and definition of standards and standard solutions - primary and secondary. The concept and definition of the volumetric determination; Seminar: Solving problems.
11th week : The concept and definition of volumetric determinations- Argentometric titration; Seminar: Solving problems.
12th weeks The concept and definition of volumetric determinations based on neutralization reactions - acid-base titration; Seminar Solving problems
13th week . The concept and definition of volumetric determinations based on the complex - complexometric titrations; Seminar Solving problems
14th week . The concept and definition of volumetric determinations based on redox reactions. Seminar Seminar Solving problems
15th week : Recapitulation of theoretical and seminars lecture II partial exam .theoretical lecture and seminars.
Laboratory excersise: Introduction to laboratory work. Qualitative chemical analysis – determination of group of cations and anions. Gravimetric determination nickel cations.
volumetric methods: Preparation of standard solutions. Acid-base titration. Complexometric Titrations. Oxidation-reduction titration. Potentiometric titration</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
□ on linein entirety
□ partial e-learning
□ field work</td><td colspan="3">□ independent assignments
☒ multimedia
☒ laboratory
□ work with mentor
□ (other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6">Lectures attendance - at least 80% and completing exercises</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>2.0</td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>1.0</td><td>Oral exam</td><td>2.0</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>2.0</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">The entire test can be applied over two partial tests during the semester. Passing threshold is 60%. Each test in assessing participates with 50%. Lectures presence of 80 to 100% is 10% marks. The examination periods there is a written and oral exam. Passing threshold is 60%. Passing one partial test of any part (previous activity) is valid throughout current academic year. Written exam has a share of 50% and oral examination also 50%. Students who have not passed the partial tests will have oral examination in the regular examination period. Passing threshold is 60% and the examination form to participate in the evaluation by</td></tr>
</table>

	50%. Rating: 60% -69% - satisfactory, 70% -79% - good, 80% -89% very good, 90% - 100% - excellent.		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	1. D. A. Skoog, D. M. West i F. J. Holler, Osnove analitičke kemije, Školska knjiga, Zagreb, 1999.,	1. 6	
	2. A. Prkić, Vježbe iz analitičke kemije, Preddiplomski studij kemijske tehnologije, interna recenzirana skripta, Split, 2008.		
	3. R. Kellner, J.M. Mermet, M. Otto, M. Varcarcel, H.M. Widmer, Analytical Chemistry (A Modern Approach to Analytical Science, 2nd Edition) Wiley-VCHVerlag Gmbh&Co. KGaA, Weinheim, 2004		KTF web page
	4. D. A. Skoog, D. M. West i F. J. Holler, S. R. Crouch, Fundamentals of Analytical Chemistry, 9th edition, Brooks&Cole, SAD, 2014.	1	KTF web page
Optional literature (at the time of submission of study programme proposal)	Z. Šoljić, Računanje u analitičkoj kemiji, Zagreb, 1998.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Fundamentals of organic chemistry

NAME OF THE COURSE	**Fundamentals of organic chemistry**					
Code	KTL107	Year of study	1.			
Course teacher	Ani Radonić	Credits (ECTS)	7.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30	15	30	
Status of the course	Mandatory	Percentage of application of e-learning	-			
COURSE DESCRIPTION						
Course objectives	Acquiring a basic knowledge of modern organic chemistry and nomenclature of organic compounds, understanding the structure and properties of organic compounds and the basic mechanisms of organic chemical reactions. Acquisition of basic skills and techniques required for work in organic-chemical laboratory.					
Course enrolment	-					

requirements and entry competences required for the course	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student should be able to: - use basic rules of organic compounds nomenclature - differentiate classes of organic compounds according to functional groups - connect organic compounds molecular structure with their physico - chemical properties and reactivity - differentiate organic reaction types and describe general characteristics of organic reactions - explain reaction mechanisms of main classes of organic compounds - use basic laboratory techniques for synthesis, isolation and purification of organic compounds as well as their characterization and identification
Course content broken down in detail by weekly class schedule (syllabus)	Lectures (2 hours weekly): 1st week: Introduction to organic chemistry. The binding in organic molecules. 2nd week: Molecular structure and properties of organic compounds. Isomers. Optical activity and chirality. The absolute configuration. Acid-base properties of organic compounds. 3th week: Types of organic reactions. Classification and nomenclature of organic compounds - functional groups. 4th week: Alkanes. Rotation about single bond. Oxidation. Halogenation. Alkenes. 5th week: Alkenes. Electrophilic Addition. The addition of hydrogen. The addition of halogen. The addition of hydrogen halide (Markovnikov and anti-Markovnikov rule). Hydration. Polimerization. 6th week: Alkynes. Reactions of of alkynes. Alkyl halides. Nucleophilic substitution at saturated carbon. S_N2-mechanism. S_N1-mechanism. 7th tjedan: Elimination reactions. *E1* and *E2* mechanism. Competition among substitution and elimination. Repetition of the teaching materials. 8th week: 1st partial exam. Alcohols. Ethers. 9th week: Aldehydes and ketones. Nucleophilic addition to the carbonyl group. Reactions at the α-carbon (the aldol reaction). 10th tjedan: Carboxylic acids and derivatives. Nucleophilic substitution at the carbonyl group. 11th week: Aromatic hydrocarbons. Electrophilic aromatic substitution. The impact of the groups on electrophilic aromatic substitution. Nucleophilic aromatic substitution. 12th week: Arenes. Phenols. Aromatic amines 13th week: Carbohydrates. Monosaccharides-basic reactions. Oligosaccharides. Polysaccharides. 14th week: Amines. Amino acids. Peptides and proteins. 15th week: 2nd partial exam. Seminars (1 hour weekly): Solving problems in organic chemistry. Exercises (2 hours weekly joined together in 6 lab periods): 1. Laboratory safety and rules. Isolation and purification of organic compounds. Crystallization and melting point determination. Distillation. Extraction. Organic compounds synthesis. 2. Diazotation. Phenol synthesis. 3. Carbonyl compounds-nucleophilic addition. The Cannizzaro reaction – benzyl alcohol and benzoic acid synthesis. 4. Electrophilic aromatic substitution. *p*-Nitroacetanilide synthesis.

	5. Oxidation-reduction reactions. Butan-2-one synthesis. 6. Organic compounds characterization. Characteristic reactions of functional groups.					
Format of instruction	x lectures x seminars and workshops x exercises □ *on line*in entirety □ partial e-learning □ field work			□ independent assignments x multimedia x laboratory □ work with mentor ☐(other)		
Studentresponsibilities	Students are required to attend lectures and seminars of at least 80% of the times scheduled and to complete all planned laboratory exercises.					
Screening student work*(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1.0	Research		Practical training	
	Experimental work	1.0	Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	1.0	Oral exam		(Other)	
	Written exam	4.0	Project		(Other)	
Grading and evaluating student work in class and at the final exam	A student can pass the entire exam by taking and passing two partial exams (tests) consisting of theoretical questions and seminar problems during the semester. Test passing score is 60%. Each test constitutes 40% of the final exam score. Attendance to the lectures and seminars participate in the final score with 10%.Grades achieved through laboratory exercises will constitute 10% of the final score. Any of the partial exams passed during the semester is valid throughout the academic year. Students who do not pass one of the partial exam or both of them have to take an written exam in the regular examination periods. Exam passing score is 60%. The exam will constitute 90% and laboratory exercises will constitute 10% of the final score. Grades depending on the test score: 60% - 69% - satisfactory, 70% -79% - good, 80% -89% very good, 90% -100% - excellent.					
Required literature (available in the library and via other media)	**Title**			**Number of copies in the library**	**Availability via other media**	
	S. H. Pine, Organska kemija, Školska knjiga, Zagreb, 1994.			8	-	
	I. Jerković, A. Radonić, Praktikum iz organske kemije, Udžbenici Sveučilišta u Splitu, Split, 2009.			-	Web site of institution	
Optional literature (at the time of submission of study programme proposal)	S. Borčić, O. Kronja, Praktikum preparativne organske kemije, Školska knjiga, Zagreb, 1991.					
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University					
Other (as the proposer wishes to add)						

Fundamentals of physical chemistry

<table>
<tr><td colspan="2">NAME OF THE COURSE</td><td colspan="6">Fundamentals of physical chemistry</td></tr>
<tr><td>Code</td><td>KTL108</td><td>Year of study</td><td colspan="5">1.</td></tr>
<tr><td>Course teacher</td><td>Renato Tomaš</td><td>Credits (ECTS)</td><td colspan="5">7.0</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>30</td><td>15</td><td>30</td><td></td></tr>
<tr><td>Status of the course</td><td>Mandatory</td><td>Percentage of application of e-learning</td><td colspan="5"></td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">The aims of the course are to enable students to:
- understand basic concepts, laws and principles of thermodynamic and kinetic approaches to physical and chemical changes,
- resolve different physicochemical problems,
- perform measurements in the laboratory individually or in a team, present and process measurement data,
- apply acquired knowledge and skills in professional and specialist courses.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">Course enrollment prerequisite is General Chemistry.
Required competences are knowledge of Mathematics (Calculus) and fundamentals of Physics and Chemistry.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Upon successful completion of the program, students will be able to:
1. Describe basic concepts, laws and principles of thermodynamic and kinetic approaches to physical and chemical changes.
2. Explain different physicochemical dependencies of the examined systems.
3. Calculate physicochemical parameters using thermodynamic and kinetic equations.
4. Perform experiments and measurements in the laboratory.
5. Interpret experimental and numerical data.</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="7">Lectures (2 hours weekly):
1st week: Introduction: Physical chemistry - course contents. Basic terms. System and surroundings. Intensive and extensive thermodynamic variables. Progress of the reaction. Zeroth low of thermodynamics.
1st and 2nd week: Properties of gases: The perfect gas equation of state. The ideal gas temperature scale. Ideal gas mixtures and Dalton's law. The kinetic model of gases. Real gases. The van der Waals equation of state.
2nd, 3rd and 4th week: First law of thermodynamics: Work and heat. Internal energy. Enthalpy. Heat capacities. Joule-Thomson expansion. Adiabatic processes with gases. Thermochemistry. Enthalpy of formation. Calorimetry.
4th, 5th and 6th week: Second and third laws of thermodynamics: Direction of spontaneous change. Entropy as a state function and the second law. Entropy changes in system and surroundings. Entropy changes in irreversible processes. Entropy change accompanying a phase transition. Entropy of mixing ideal gases. Calorimetric determination of entropies and the third law. Gibbs energy. Properties of the Gibbs energy.
6th and 7th week: Phase equlibria-pure substances: Condition of stability. Variation of Gibbs energy with pressure. Variation of Gibbs energy with temperature. Phase diagrams, phase boundaries and location of phase boundaries. The phase rule. Significance of the chemical potential. Fugacity.
8th i 9th week: Properties of mixtures: Partial molar properties. Gibbs-Duhem equation. The chemical potentials of liquids. Spontaneous mixing. Ideal solutions. Ideal-dilute solutions. Real solutions: activities. Colligative properties. Phase</td></tr>
</table>

<table>
<tr><td></td><td colspan="6">diagrams of mixtures.
10th and 11th week: Principles of chemical equilibrium: Homogeneous and heterogeneous reactions. The reaction Gibbs energy. Reactions at equilibrium. Equilibrium constants and determination of equilibrium constants. Standard reaction Gibbs energy. Effect of temperature on the equilibrium constant. Effect of pressure, initial composition, and inert gases on the equilibrium composition.
11th and 12th week: Ionic equilibria: Activity of electrolytes. Debye-Hückel theory. Proton transfer equilibria. Salts in water. Solubility equilibria.
12th and 13th week: Electrochemistry: Ions in solution and migration of ions. Conductivity of electrolyte solutions. Viscosity. Strong and weak electrolytes. The drift speed. Ion mobilities. Mobility and conductivity. Measurement of transport numbers. Electrochemical cells. Varietes of cell. The cell reaction and electromotive force. Cells at equilibrium. Standard potentials. Determination of pH. Membrane potential.
13th i 14th week: Chemical kinetics: Empirical chemical kinetics. Reaction rates. Rate laws and rate constants. Reaction order. Half-lives and time constants. The temperature dependence of reaction rates. The relation between rate constants and equilibrium constants. Parallel and consecutive reactions.
15th week: Properties of surfaces: Properties of liquid surfaces. Colloidal systems. Adsorption on solid surfaces. Adsorption isotherms. Catalytic activity at surfaces.
Seminars (one hour weekly): Solving numerical problems in physical chemistry.
Exercises (five hours weekly): By working out 6 exercises student evidences in practice some of the principles presented through lectures and seminars: Coligative properties. Viscosity. Chemical equilibrium. Phase diagrams of ternary system. Conductivity and conductometric titration. Kinetics of inversion saccharose by polarimetric method.</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
x seminars
x exercises
□ on linein entirety
□ partial e-learning
□ field work</td><td colspan="3">□ independent assignments
X multimedia
X laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Lecture and seminar attendance and active participation of at least 70 percent of the planned schedule. Complete all laboratory exercises.
The exam can be taken continuously (cumulatively) through colloquiums (partial tests) combining theoretical and practical tasks or as one comprehensive exam (written and oral).</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.5</td><td>Consultations</td><td>0.2</td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.5</td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>2.0</td><td>Oral exam</td><td>1.0</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.8</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continually evaluation: (success (%) / share in evaluating (%):
• presence and activities in the classroom: (70 - 100 / 10)
• laboratory exercises: (100 / 15)
• first partial test: (60 - 100 / 25)
• second partial test: (60 - 100 / 25)
• third partial test: (60 - 100 / 25)</td></tr>
</table>

	Final evaluation: (success (%) / share in evaluating (%): • written exam with numerical tasks: (50 - 100 / 40) • oral exam: (50 - 100 / 45) • priviously activities from continually evaluation: (50 - 100 / 15)		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	P. Atkins, J. de Paula, Elements of Physical Chemistry, 4th Edition, Oxford University Press, Oxford, 2005.	2	
	R. J. Silbey, R. A. Alberty, M. G. Bawendi, Physical Chemistry, 4th Edition, John Wiley and Sons, New Jersey, 2005.	1	
	R. Tomaš, Own lectures from physical chemistry, powerpoint presentation, 2009.		digital source
	J. Radošević, Lj. Aljinović, Fizikalna kemija, Laboratorijske vježbe, Sveučilišna naklada Liber, Split, 1980.	25	
	I. Tominić, Fizikalna kemija II, Kemijsko-tehnološki fakultet, Split, 2010.		www.ktf-split.hr
Optional literature (at the time of submission of study programme proposal)	I. Mekjavić, Fizikalna kemija 1, Školska knjiga Zagreb, 1996. I. Mekjavić, Fizikalna kemija 2, Golden marketing, Zagreb, 1999. A. M. Halpern, Experimental Physical Chemistry, A Laboratory Textbook, 2nd Edition, Prentice Hall, New Jersey, 1997.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Safety at work

NAME OF THE COURSE	**Safety at work**					
Code	KTL109	Year of study	1.			
Course teacher	Pero Dabić	Credits (ECTS)	4.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		15	
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	- Knowledge of the potential hazards when working in a laboratory and plant. - The basics of working in a safe manner, safeguards and protective devices and agents at work					

<table>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6">None.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">After passing the exam the student is expected to know:
- Rules of conduct and work in the chemistry lab
- Basic hazards in a chemistry lab
- Ways of marking substance, meaning chemical Card (data on physico-chemical, physiological and toxicological properties of the substance)
- Assessment of the potential dangers of certain chemicals and working with the apparatuses and methods of protection at work</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1st week: an introductory lecture, legislation, codes of conduct in the laboratory
2nd week: the security apparatus in the chemistry lab
3rd week: safety and physico- chemical properties of the substance
4th week: Classification of substances with similar properties and functional groups
5th week: labeling - labels , graphic symbols , diamond hazard label when transporting
6th week: effect of pollutants on human health - basic concepts of toxicology and physiological properties of the substance, MAC, LD50
7th week: effect of pollutants on human health - division and features matter to the physiological properties
8th week: assessment (first colloquium);
9th week: burning processes and fire danger
10th week: appliances and equipment for fire fighting
11th week: Model Fire Extinguishers
12th week: types of harmful atmosphere and breathing apparatus
13th week: protection of electricity
14th week: dangerous products - the formation, classification according to UN figures, storage, recycling and waste
15th week: assessment (2nd colloquium).
Laboratory exercises:
Exercise 1. Stability of the alkali metal
Exercise 2. Material flammability test
Exercise 3. Determination of ignition point by Marcusson
Exercise 4. Determination of physico - chemical properties of the solution with the aim of assessing the potential hazards</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
□ seminars and workshops
x exercises
□ on linein entirety
□ partial e-learning
x field work</td><td colspan="3">□ independent assignments
x multimedia
x laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6">Attending lectures in the amount of 80 %, and laboratory exercises in the amount of 100 % of the total number of lessons.</td></tr>
<tr><td rowspan="3">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td>0.8</td></tr>
<tr><td>Experimental work</td><td>1.0</td><td>Report</td><td></td><td>Preparation for the preliminary lab. exercises</td><td>0.2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
</table>

equal to the ECTS value of the course)	Tests		Oral exam		(Other)	
	Written exam	1.0	Project		(Other)	
Grading and evaluating student work in class and at the final exam	Continuous evaluation: The entire test can be applied over two exams during the semester. Passing threshold is 60 %. Each colloquium in assessing participates with 35 %. Laboratory exercises participate in the evaluation of 20 %. The presence of lectures in 80-100 % amount is 10 % of the grade. Final evaluation: Students who have passed the preliminary one, it is recognized as part of the exam and a 35 % score. The remaining part is laid in the regular examination period. Students who have not passed any preliminary examination, written examination in the regular examination period laid the whole subject matter. Passing threshold is 60 %, and a written examination form to participate in the evaluation by 80 %. Laboratory work involved in assessing the proportion of 20 %. Rating: sufficient (60-70 %), good (71-80 %), very good (81-90 %), excellent (91-100 %).					

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	P. Dabić_Sigurnost pri radu_Autorizirana predavanja _2013.	1	KTF website
	R. H. Hill, D.C. Finster, Laboratory Safety for Chemistry Students, John Wiley & Sons, Hoboken, New Jersey, 2010.	1	
	P. Dabić, Vježbe iz kolegija sigurnost pri radu, KTF, Split, 2010.	1	

Optional literature (at the time of submission of study programme proposal)	- B. Uhlik, Zaštita od požarno opasnih, toksičnih i reaktivnih tvari (I-III), Hrvatsko društvo kemijskih inženjera, Zagreb, 1998., 2000., 2003. i 2013. - Zakon o zaštiti na radu, Zavod za istraživanje i razvoj sigurnosti, Zagreb, 2010.
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University
Other (as the proposer wishes to add)	

Fundamentals of mechanical structures

NAME OF THE COURSE	**Fundaments of mechanical structures**					
Code	KTL110	Year of study	1.			
Course teacher	Lovre Krstulović-Opara	Credits (ECTS)	4.0			
Associate teachers	Željko Domazet	Type of instruction (number of hours)	L	S	E	F
			15	15		
Status of the course	Mandatory	Percentage of application of e-learning	30%			

<table>
<tr><th colspan="7">COURSE DESCRIPTION</th></tr>
<tr><td>Course objectives</td><td colspan="6">Basic knowledge in technical drawing, strength of materials, and parts of machinery in chemical industry</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">- being capable to read and understand technical drawing
- understanding the need for dimensioning machinery parts
- recognising basic machinery parts
- recognising basic parts in chemical industry</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Week 1: Introduction to mechanical structures. National codes. Technical drawing – basics.
Week 2: Technical drawing – cross sections, displays, dimensions.
Week 3: Technical drawing – surface finishes, tolerances
Week 4: Technical drawing – CAD, rapid prototyping, 3D scanning
Week 5: Basics of mechanics (statics, kinematics, dynamics). Materials for mechanical design. (steel alloys, cast steel materials)
Week 6: Materials for mechanical design. (copper and aluminium alloys)
Week 7: Materials for mechanical design (sinter materials, polymers). Dimensioning of structures.
Week 8: 1st colloquium. Introduction to parts of machinery.
Week 9: Bolts, springs, welding and soldering
Week 10: Shafts and clutch
Week 11: Bearings and transmissions (belt drives, friction drives)
Week 12: Gearing and chain transmissions
Week 13: Mechanical parts in chemical industry (tubes and valves)
Week 14: Vessels and seals
Week 15: 2nd colloquium</td></tr>
<tr><td>Format of instruction</td><td colspan="3">X lectures
□ seminars and workshops
□ exercises
□ on linein entirety
□ partial e-learning
□ field work</td><td colspan="3">□ independent assignments
X multimedia
□ laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6">Attending 70% of courses</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>1.0</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>2.0</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Exam is written. Exam can be passed by partially by passing two colloquiums and gaining 50% (50 points of maximum 100). Minimum for passing exam is gaining 50% on colloquiums or regular exam. Requirement for attending second colloquium is gaining 25% (25 points) on first colloquium. Colloquiums can be repeated during first two exams. Marks: 50%-61% - minimum (2), 62%-74% - good (3), 75%-87% -</td></tr>
</table>

	very good (4), 88%-100% - excellant (5).		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Ž. Domazet, L. Krstulović-Opara, Skripta iz Osnova strojarstva, KTF, Split, 2006.	1	KTF web pages
Optional literature (at the time of submission of study programme proposal)	V. Hrgešić i J. Baldani, "Mehaničke Konstrukcije", Sveučilište u Zagrebu - Elektrotehnički Fakultet, Zagreb, 1990. E. Hercigonja, Tehnička grafika, Školska knjiga, Zagreb, 1994. K.-H. Decker, Elementi strojeva, Tehnička knjiga, Zagreb, 1980		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Thermodynamics and thermotechnics

NAME OF THE COURSE	**Thermodynamics and thermotechnics**					
Code	KTL201	Year of study	2.			
Course teacher	Vanja Martinac	Credits (ECTS)	6.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30	15	15	
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	The aim of the course is to provide students with wide knowledge of basic thermodynamic principles related to their application in engineering.					
Course enrolment requirements and entry competences required for the course						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam, students are expected to: 1. specify and define the units of measurements of basic thermodynamic magnitudes and the state equations (for ideal and real gases) 2. specify and correctly interpret the basic laws of thermodynamics 3. specify and explain thermodynamic changes of the state of ideal and real gases 4. define and explain the processes of expansion and compression 5. define and explain maximum work, technical work and exergy 6. define and explain clockwise circular processes 7. define and explain irreversible processes (throttling, mixing of gases) 8. discern and analyse processes in devices used to obtain low temperatures 9. define and explain the principle of corresponding states, fugacity, partial molal quantities					

<table>
<tr><td></td><td colspan="6">10. apply the knowledge acquired to solving tasks related to changes of the state of ideal and real gases and liquids, compression processes, clockwise and counter-clockwise circular processes, and processes in technical heat exchangers.</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1. week: General consideration. Maximum work of the system.
2. week: Application of the second law of thermodynamics to energy transformation - exergy and anergy.
3. week: Reversible processes for ideal gases. Cyclic processes.
4. week: Technical plants for cyclic processes. Irreversibility and losses in cyclic processes.
5. week: Compressors - processes in compressors.
6. week: Real gases and steams. Water vapor. Thermodynamic diagrams and tables for variables of state.
7. week: Vapour power cycles.
8. week: Refrigerators - processes in refrigerators. Heat pump.
9. week: Liquefaction of gases according to Linde, Claude and Kapica.
10. week: Thermodynamic properties of fluids. Equations of state of real gases and their mixtures.
11. week: The principle of corresponding states. Application to gases and liquids. Improved principle of corresponding states – the Pitzer correlation.
12. week: Fugacity. Methods of calculating fugacity.
13. week: Solutions – partial molal quantities. Methods of calculation of partial molal quantities.
14. week: Thermotechnics – Modes of heat transfer. Laws of heat transfer. Combined modes of heat transfer.
15. week: Applied of heat transfer to some special cases. Heat exchangers.
Numeric examples demonstrating the topics covered are analysed during the course, making an integral whole with the lectures.
Examples from the engineering practice are solved during exercises.
List of Exercises:
Exercise 1. Mixing of Ideal Gases at V = const.
Exercise 2. Mixing of Ideal Gases at p = const.
Exercise 3. Rankine Cycle – Superheated
Exercise 4. Methods for Increasing the Thermal Efficiency of Vapour Power Plants
Exercise 5. Regenerative Vapour Power Cycle
Exercise 6. Comparison Gas Power and Gas Refrigeration Systems
Exercise 7. Comparison Vapor power and Vapor-Compression Refrigeration Systems</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
□ seminars and workshops
x exercises
□ on linein entirety
□ partial e-learning
□ field work</td><td colspan="3">□ independent assignments
x multimedia
□ laboratory
□ work with mentor
x seminar (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="4">Screening student work(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Problem/task solving during exercises (Other)</td><td>1.0</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>1.0</td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>1.0</td><td>Oral exam</td><td>1.0</td><td>(Other)</td><td></td></tr>
</table>

<table>
<tr><td>value of the course)</td><td>Written exam</td><td>1.0</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment through partial preliminary exams (three times in a semester) allows for exemption from the written exam. The passing threshold is 60 %. Partial preliminary exams are not mandatory. Preliminary exams are not eliminatory. Each passed preliminary exam participates with 12 % in the rating. Attendance to lectures and seminars (80%-100%) participates with 5% in the rating. Activity in exercises participates with 5% in the rating. The oral part of the exam participates with 54% in the rating. A written and an oral exam are taken in examination periods. The oral exam is mandatory for all students, and the written one is mandatory only if the student is not exempt from it. A passed preliminary exam (prior activity) in the summer examination period participates with 10% in the rating. The written exam participates with 36% and the oral one with 54%. Students who have not passed the written exam through preliminary exams take the full exam (final exam) consisting of the written and the oral exam in regular examination periods. The passing threshold is 60 %, and each exam form participates in the rating with 50 %. The written part of the exam participates in the rating with 46%, and the oral part with 54%. Ratings: 60%-70% - satisfactory, 71%-80% - good, 81%-90% - very good, 91%-100% - excellent</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">1. N. Petric, I. Vojnović, V. Martinac, Technical thermodynamics (in Croatian), 2nd Ed., on line (2007-01-09), Faculty of Chemistry and Technology, Split, 2007.</td><td></td><td colspan="2">on line</td></tr>
<tr><td colspan="3">2. V. Martinac, Thermodynamics and Thermotechnics, Handbook-Formulas and Tables, (in Croatian), on line (2008-12-09), Faculty of Chemistry and Technology, Split, 2008.</td><td></td><td colspan="2">on line</td></tr>
<tr><td colspan="3">3. M. J. Moran, H. N. Shapiro, D. B. Daisie, M. B. Bailey, Fundamentals of Engineering Thermodynamics, 7th Ed., Wiley, New York, 2010.</td><td>1</td><td colspan="2"></td></tr>
<tr><td colspan="3">4. Yunus A. Cengel, Introduction to Thermodynamics and Heat Transfer, 2nd Ed., McGraw-Hill, New York, 2008.</td><td>1</td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">1. Y. A. Cengel, M. A. Boles, Thermodynamics: An Engineering Approach, 7th Ed., McGraw-Hill, New York, 2011.
2. R. E. Sonntag, C. Borgnakke, G. J. Van Wylen, Fundamentals of thermodynamics, 8th Ed., Wiley, New York, 2012.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

Unit operations

NAME OF THE COURSE	Unit operations					
Code	KTL202	Year of study	2.			
Course teacher	Renato Stipišić	Credits (ECTS)	8.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30	15	25	5
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	Acquiring the knowledge required for understanding chemical engineering problems related to unit operations that are applied in the chemical and related industries (food, pharmaceutical etc.)					
Course enrolment requirements and entry competences required for the course	Undergraduate courses: General and Inorganic Chemistry, Analytical Chemistry, Fundamentals of Organic Chemistry, Principles of Physical Chemistry, Mathematics, Chemistry and computing.					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student is expected to know: - Basic mechanisms of mass and energy transfer (transport phenomena) - Conservation of momentum, energy, mass - Occurrence in fluid flow - Equipment for the fluids and solids transport - Flow past immersed bodies. - Methods and equipment for separation - Heat transfer equipment. - Mass Transfer Operations					
Course content broken down in detail by weekly class schedule (syllabus)	1st week: Introduction and overview of the course content. Fundamentals of fluid mechanics. Fluid properties. 2nd week: Fluid statics. Fluid dynamics. 3rd week: Pressure drop in pipes and fittings. 4th week: Transportation of fluids and solids. 5th week: Centrifugal pumps. 6th week: Size reduction. Screening. 7th week: Flow past immersed bodies. Sedimentation. 8th week: Fluidization. Separation. 9th week: Filtration. Mixing. Examination I 10th week: Heat Transfer. Conduction. 11th week: Convection. Radiation. 12th week: Heat exchangers . 13th week: Mass Transfer. Absorption. 14th week: Drying. Extraction. 15th week: Distillation. Examination II Exercises: 1. Determination of flow types and critical Re-number visual observation. 2. Determination of pressure drop in pipes and fittings. 3. Fluidization - determination of fluidized bed. 4. Filtration - determination of the constants and the average specific filtration resistance. 5. Mixing - determination power consumption of agitated vessels.					

<table>
<tr><td></td><td colspan="6">6. Heat exchangers - determination of heat transfer coefficients.
7. Absorption - pressure drop and capacity of filled towers.</td></tr>
<tr><td>Format of instruction</td><td colspan="3">X lectures
seminars and workshops
X exercises
on linein entirety
partial e-learning
X field work</td><td colspan="3">independent assignments
X multimedia
laboratory
work with mentor
(other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6">Attendance at lectures in the amount of 80% of the hourly rate.
Attendance of the exercises in the amount of 100% of the hourly rate.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2.0</td><td>Research</td><td></td><td>Practical training</td><td>2.0</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td>2.0</td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>2.0</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">The entire test can be applied over two written exams during the semester. Passing threshold is 60%. Each exam involved in the assessment with 50%. The examination periods shall be taken oral exam. Passing threshold is 60%. Rating: 60 - 69% - sufficient (2), 70 - 79% - good (3), 80-89% very good (4), 90 - 100% - excellent (5).</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">W.L. McCabe, J.C. Smith, P. Harriott, Unit Operations of Chemical Engineering, McGraw-Hill, 6thedition, New York, 2001.</td><td>1</td><td colspan="2"></td></tr>
<tr><td colspan="3">M. Hraste, Mehaničko procesno inženjerstvo, HINUS, Zagreb, 2003.</td><td>10</td><td colspan="2"></td></tr>
<tr><td colspan="3">R.M. Felder, R.W. Rousseau, Elementary Principles of Chemical Processes, John Wiley & Sons, Inc., New York, 2000.</td><td>1</td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">1. R.H. Perry, D.W. Green, J.O. Maloney, Perry's Chemical Engineer's Handbook, 7th edition, McGraw-Hill, New York, 1999.
2. V. Koharić, Mehaničke operacije, Sveučilište u Zagrebu, Zagreb, 1996.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

Electrochemical engineering

<table>
<tr><td colspan="2">NAME OF THE COURSE</td><td colspan="5">Electrochemical engineering</td></tr>
<tr><td>Code</td><td>KTL203</td><td>Year of study</td><td colspan="4">2.</td></tr>
<tr><td>Course teacher</td><td>Senka Gudić</td><td>Credits (ECTS)</td><td colspan="4">5.5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>30</td><td></td><td>30</td><td></td></tr>
<tr><td>Status of the course</td><td>Mandatory</td><td>Percentage of application of e-learning</td><td colspan="4">-</td></tr>
<tr><td colspan="7">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="6">Student will be able to use acquired knowledge of electrochemistry and electrochemical engineering and applied it to industrial electrochemistry processes.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6">Fundamentals of physical chemistry - enrolled.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">After the successfully passed exam student is able to:
- describe the components and processes in the electrochemical reactor
- explain the structure of electrified phase boundary
- differentiate between the concepts of polarization and overvoltage
- explain the causes of different overvoltage types
- set the voltage balance, material balance and energy balance
- ddistinguish between primary and secondary current distribution and potential
- indicate the main types of electrochemical reactors
- describe the basic methods of connecting electrodes and reactors in practice
- specify the materials used in electrochemical reactors manufacturing.</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1st week: Introduction. Constituent parts and operation in electrochemical reactor. Electrochemical conversion - quantum lows.
2nd week: Electrified phase boundary. Thermodynamic of electrified phase boundary.
3rd week: Double-layer structure.
4th week: Electrochemical systems in non-equilibrium conditions. Anodic and cathodic processes.
5th week: Electrochemical reaction mechanism and rate determining step. Polarization and overpotential. Overpotential types
6th week: Electrochemical overpotential.
7th week: Diffusion overpotential. Reaction ovrepotential. Crystallization overpotential.
8th week: First test. Voltage balance and material balance in electrochemical reactor.
9th week: Energy balance in electrochemical reactor. Current efficiency. Transport phenomena in electrochemical system.
10th week: Dynamic of electrolyte solutions. Thermal effects in electrochemical reactor.
11th week: Distribution of current and potential in electrochemical reactor - primary and secondary distribution.
12th week: Technological demands in electrochemical engineering. Types of electrochemical reactors.
13th week: Monopolar and bipolar electrodes connecting. Electrical connection of multiple reactors on a common power source. Circulating of electrolyte.
14th week: Materials selection for construction of electrochemical reactors.
15th week: Second test.</td></tr>
</table>

<table>
<tr><td></td><td colspan="6">Exercises: Electrolyte decomposition voltage. Electrogravimetric analysis. Determination of hydrogen overpotential on various metals. Electrochemical production of calcium gluconate. Electrorefining of silver. Distribution of potential during the electrolysis (plate shaped anode / ring shaped anode). Electrocatalysis - selection of an optimal electrode material. Determination of the dependence of the limiting current density on electrolyte flow rate.</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
□ seminars and workshops
x exercises
□ on linein entirety
□ partial e-learning
□ field work</td><td colspan="3">□ independent assignments
x multimedia
x laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Lecture attendance: 80 %. Laboratory exercises attendance: 100 %.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.5</td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>2.0</td><td>Oral exam</td><td>1.0</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">The complete exam can be passed through two tests during semester. The passing score is 60 % and the fraction of each test is 40 %. The fraction of laboratory exercises is 20%. In the exam period the student has to attend to oral exam.
Grades: 60-69% sufficient, 70-79% good, 81-89% very good, 90-100% excellent.</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">A. Despić, Osnove elektrokemije 2000, Zavod za udžbenike i nastavna sredstva, Beograd, 2003.</td><td>1</td><td colspan="2"></td></tr>
<tr><td colspan="3">F. Goodridge, K. Scott, Electrochemical process engineering, a guide to the design of electrolytic plant, Plenum Press, New York, 1995.</td><td>1</td><td colspan="2"></td></tr>
<tr><td colspan="3">Đ. Matić, Elektrokemijsko inženjerstvo, Zagreb, 1988.</td><td>1</td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">H. Wendt, G. Kreysa, Electrochemical engineering: science and technology in chemical and other industries, Springer, Berlin, 1999.
D. Pletcher, F.C. Walch, Industrial electrochemistry, Charman and Hall, New York, 1990.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

Chemical reactors

<table>
<tr><td colspan="2">NAME OF THE COURSE</td><td colspan="5">Chemical reactors</td></tr>
<tr><td>Code</td><td>KTL204</td><td>Year of study</td><td colspan="4">2.</td></tr>
<tr><td>Course teacher</td><td>Sandra Svilović</td><td>Credits (ECTS)</td><td colspan="4">5.0</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>30</td><td></td><td>15</td><td></td></tr>
<tr><td>Status of the course</td><td>Mandatory</td><td>Percentage of application of e-learning</td><td colspan="4"></td></tr>
<tr><td colspan="7">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="6">Students will be acquainted with the basic knowledge in the field of chemical reaction engineering and different types of chemical reactors as well as basic knowledge of software Mathcad and kinetic of homogenous and heterogeneous reaction in reactors.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6"></td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">After completing the course, the student will become familiarized with:
- definition of reactor
- definition of the rate of reaction, the reaction order, the reaction rate constant
- the differences between kinetics in homogenous and heterogeneous systems, definition of the slowest step in the process
- characteristics of the basic types of the reactors
- types of multiphase reactors
- application and types of experimental catalytic reactors</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1st week: introduction, reactor as a processing unit in a technological process
2nd week: classification and characteristics of main types of reactors
3rd and 4th week: kinetics of chemical reactions in homogenous systems, the reaction order, the reaction rate constant
5th week: classification of chemical reactions, forward and reverse reaction
6th week: kinetics of chemical reactions in heterogeneous systems
7th week: ideal reactors, heat and mass balance for the basic types of chemical reactors
8th week: ideal batch reactor
9th week: partial knowledge test
10th week: ideal tubular reactor
11th week: ideal continuous-stirred tank reactor; CTSRs in series
12th week: catalysis and experimental catalytic reactors
13th week :multiphase reactors
14th week: reactors evaluation and ratings
15th week: microreactors
partial knowledge test
Exercises: Mathcad basic - toolbars, calculator, graph, formatting, units, functions, method of least squares. Kinetics of homogenous reaction. Kinetics of heterogeneous reactions: influence of agitation speed on rate-controlling step, influence of particle size on rate-controlling step.</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
□ seminars and workshops
x exercises
□ on linein entirety
□ partial e-learning
□ field work</td><td colspan="3">x independent assignments
x multimedia
x laboratory
□ work with mentor
□ (other)</td></tr>
</table>

Student responsibilities	Regular attendance and active participation at lectures and exercises.					
Screening student work*(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1.5	Research		Practical training	
	Experimental work	1.0	Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	1.0	Oral exam	0.5	(Other)	
	Written exam	1.0	Project		(Other)	
Grading and evaluating student work in class and at the final exam	A student can pass a part or the entire exam by taking two partial tests during the semester. Students who do not pass the partial exams have to take an exam in the regular examination term. During the examination terms students take written and oral exam. Scoring: <55% insufficient;55-66% sufficient (2); 67-79% good (3); 80-92% very good (4); 93-100% excellent (5)					

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Z. Gomzi, Kemijski reaktori, HINUS, Zagreb, 1998.	10	
	S. G. Fogler, Elements of, Chemical Reaction Analysis and Design, Prentice-Hall, Englewood, N.J., 2006	1	

Optional literature (at the time of submission of study programme proposal)	S. G. Fogler, Elements of, Chemical Reaction Analysis and Design, Prentice-Hall, Englewood, N.J.,2006.; S. Zrnčević, Kataliza i katalizatori, HINUS, Zagreb, 2005.
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University
Other (as the proposer wishes to add)	

Metal construction materials

NAME OF THE COURSE	**Metal construction materials**						
Code	KTL205	Year of study	2				
Course teacher	Ladislav Vrsalović	Credits (ECTS)	5.5				
Associate teachers		Type of instruction (number of hours)	L	S	E	F	
			30		20	10	
Status of the course	Mandatory	Percentage of application of e-learning					
COURSE DESCRIPTION							
Course objectives	Students will get the complete knowledge of metallic materials, their physical and chemical properties relevant to their application, as well as the possibilities of their						

<table>
<tr><td></td><td colspan="6">surface treatment and joining.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6"></td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">After passing the exam the student is expected to know:
- Describe the basic characteristics of metallic structural materials.
- Compare the methods for the surface treatment of metals.
- Present methods for metal investigation.
- Describe the methods of joining metals.
- Analyse the recycling and disposal options for scrap metal.</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1st week: Description and view the contents of the curse. Introduction. Types of metal materials.
2nd week: Physical and chemical properties of metallic materials
3rd week: Iron production. Classification and properties of iron and its alloys. Application.
4th week: Steel Production. Classification of steels. Application.
5th week: Light and non-ferrous metals and their alloys.
6th week: Production of aluminum and alloys.
7th week: Special metals. Norms. (I. partial written exam)
8th week: The mechanical properties of the metal. Basic non-destructive and destructive methods of testing of metals.
9th week: Corrosion behavior of metals under exposure conditions.
10th week: Processing and methods for the improvment the properties of metallic materials.
11th week: Surface treatment of metals.
12th week: Review of techniques for joining and cutting of materials. Riveting. Soldering.
13th week: Welding and Cutting. Build up by welding.
14th week: Recycling and disposal of scrap metal.
15th week: Repetition. (II partial writen exam).
LABORATORY EXERCISES:
Phase diagram, thermal analysis. Investigation of strength, hardness, bending resistance and impact resistance different steels materials. Joining of metallic materials by soldering and welding methods. Investigations of welded joints with penetrants and ultrasonic method. Investigations of metal materials microstructure by metallographic microscope. Chemical formation of a zinc coating on copper alloys. Passivation of stainless steels.</td></tr>
<tr><td>Format of instruction</td><td colspan="3">× lectures
□ seminars and workshops
× exercises
□ on linein entirety
□ partial e-learning
× field work</td><td colspan="3">□ independent assignments
× multimedia
× laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Attending lectures in the amount of 80%. All laboratory exercises successfully finished.</td></tr>
<tr><td rowspan="3">Screening student work (name the proportion of ECTS credits for each activity so that the total number of</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.0</td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
</table>

ECTS credits is equal to the ECTS value of the course)	Tests	1.0	Oral exam	1.5	(Other)	
	Written exam	1.0	Project		(Other)	
Grading and evaluating student work in class and at the final exam	The entire course can be passed by two partial exams during the semester. Passing threshold is 50%. Each partial exam in assessing participates with 50%. On examination shedule students will have oral exam. Scoring: <50% insufficient, 50%-60% - sufficient, 61% -74% - good, 75% -87% very good, 88% -100% - excellent.					

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	T. Filetin, F. Kovačićek, J. Indolf, Svojstva i primjena materijala, Fakultet strojarstva i brodogradnje, Sveučilište u Zagrebu, Zagreb, 2002.	2	
	M. Gojić, Površinska obradba materijala, Metalurški fakultet, Zagreb, 2010.	1	
	M. Gojić, Tehnike spajanja i razdvajanja materijala, Metalurški fakultet, Zagreb, 2008.	2	

Optional literature (at the time of submission of study programme proposal)	T. Filetin, Pregled razvoja i primjene suvremenih materijala, Hrvatsko društvo za materijale i tribologiju, Zagreb, 2000. S. Brkić, Nehrđajući čelici u farmaceutskoj, prehrambenoj i kemijskoj industriji, DeVeDe d.o.o., Zagreb, 2007. F. Kovačićek, D. Španicek, Materijali, osnove znanosti o materijalima, FSB, Sveučilište u Zagrebu, Zagreb, 2000. E. Stupnišek-Lisac, Korozija i zaštita konstrukcijskih materijala, Fakultet kemijskog inženjerstva i tehnologije Sveučilišta u Zagrebu, Zagreb 2007. ASM Handbook, volume 10, Materials characterization, ASM International, USA, 1998.
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University
Other (as the proposer wishes to add)	

Measuring and control technique

NAME OF THE COURSE	**Measuring and control technique**					
Code	KTL206	Year of study	2.			
Course teacher	Renato Stipišić	Credits (ECTS)	5.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	Acquisition of knowledge in working with measuring instruments to control the process and the acquisition of knowledge in the theory of process control.					

Course enrolment requirements and entry competences required for the course	Undergraduate courses: Physics, Computer application, Mechanical engineering.					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student is expected to know: - basic principles of measuring instruments - choose a quality instrument is required to measure the physical quantities essential for process control - spot the sources of error in measuring - principles of automatic process control - elements of the control loop and their assignment					
Course content broken down in detail by weekly class schedule (syllabus)	1st week: Description and view the contents of the lecture. The principles of the measurement. General characteristics of the measuring instruments. 2nd week: Pressure Measurement. Division of pressure instruments. Liquid manometers. 3rd week: Manometers with solid weights. Deformation manometers. Vakuummeters. 4th week: Temperature measurement. Dilatation thermometers. Thermocouples. 5th week: Heat resistant thermometers. Radiation pyrometers. 6th week: Flow measurement. Dynamic flowmeters. Surface flowmeters. 7th week: Turbine flowmeters. Flowmeters based on fluid properties. 8th week: Ionization flowmeters. The ultrasonic flowmeters. Fluid velocity sensors. 9th week: Level measurement of liquids and solids. Examination I 10th week: Introduction to process control. Basic concepts and procedures. 11th Week: Types of process control. Examples process control. 12th week: The outline view of the control loop. Property of the control loop. 13th week: Synthesis and analysis of the control loop. 14th week: Regulators. 15th week: Control valves. Other components in the control loop. Examination II Exercises: 1. Static characteristics of the measuring instrument. 2. Dynamic characteristics of the measuring instrument. 3. Simulation of kinetics. 4. Laplace transforms. 5. Systems of first order. 6. Determination of transfer functions. 7. Analysis of system with no controller and with P and PI controller. 8. Analysis of the chemical reactions kinetics.					
Format of instruction	X lectures seminars and workshops X exercises *on line*in entirety partial e-learning field work			independent assignments X multimedia laboratory work with mentor (other)		
Studentresponsibilities	Attendance at lectures in the amount of 80% of the hourly rate. Attendance of the exercises in the amount of 100% of the hourly rate.					
Screening student work*(name the proportion of ECTS credits for*	Class attendance	2.0	Research		Practical training	1.5
	Experimental work		Report	0.5	(Other)	

eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)	Essay		Seminar essay		(Other)	
	Tests		Oral exam	1.0	(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	The entire test can be applied over two written exams during the semester. Passing threshold is 60%. Each exam involved in the assessment with 50%. The examination periods shall be taken oral exam. Passing threshold is 60%. Rating: 60 - 69% - sufficient (2), 70 - 79% - good (3), 80-89% very good (4), 90 - 100% - excellent (5).		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	J. Božičević Temelji automatike I, Školska knjiga, Zagreb, 1992.	16	
	J. Božičević Temelji automatike II, Školska knjiga, Zagreb, 1992.	16	
	R. Žanetić, R. Stipišić, Mjerni pretvornici u procesnoj industriji, Skripta za internu upotrebu, KTF- Split, 2005.	3	web
	R. Žanetić, Vođenje procesa u proizvodnji, Skripta za internu upotrebu, KTF- Split, 2006.	3	web
Optional literature (at the time of submission of study programme proposal)	1. Seborg, D. E., T. F. Edgar & D. A. Mellichamp, Process Dynamics and Control, 2nd ed., John Wiley & Sons, New York, 2010. 2. W. Altman, D. Macdonald, Practical Process Control for Engineers and Technicians, Elsevier, London, 2005.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Polymerization processes

NAME OF THE COURSE	**Polymerization processes**					
Code	KTL207	Year of study	2.			
Course teacher	Matko Erceg	Credits (ECTS)	5.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	- knowledge about mechanisms of polymerization reactions (step-growth and chain growth) and their technological implementation					

	- ability to work in the production facilities and/or laboratories - understanding the importance of polymers in modern society
Course enrolment requirements and entry competences required for the course	None.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student is expected to: - differentiate the basic types of polymers - differentiate the basic polymerization reaction - explain the basic parameters of the polymerization processes - explain which commodity polymers are obtained by which polymerization reaction - to perform selected polymerization reaction at laboratory scale - conclude about the importance of polymers in modern society - use the acquired knowledge in engineering practice
Course content broken down in detail by weekly class schedule (syllabus)	1st week: introduction, the historical development of synthetic polymers, nomenclature, types of polymers, world production of polymers, polymer applications. 2nd week: the production of monomers (from non-renewable and renewable resources). Polymerization reactions: step-growth and chain reactions. 3rd week: step-growth polymerization - characteristics, mechanism, kinetics, Carothers equation. 4th week: the average molecular weight - definition, types. Molecular weight distribution in step-growth polymerization. Step-growth copolymerization. 5th week: thermoplastic polymers of step-growth polymerization: polyesters (poly(ethylene terephthalate), polycarbonate), polyamides (aliphatic, aromatic), polyimides, polysulfones, polyurethanes. 6th week: thermoset polymers of step-growth polymerization: unsaturated polyesters, alkyd polymers, formaldehyde polymers, epoxies. 7th week: repetition, discussion, conclusions. Continuous assessment (the first colloquium). 8th week: chain polymerization - characteristics Radical polymerization - initiators, mechanism, kinetics. Radical copolymerization - types of copolymers, kinetics. 9th week: polymers of radical polymerization and copolymerization: polyethylenes and copolymers, polystyrene and copolymers, poly(vinyl chloride), acrylic polymers. 10th week: anionic polymerization - catalysts, mechanism, kinetics. Anionic "living" polymerization. Anionic polymers: copolymers of butadiene and styrene, polysiloxanes. 11th week: cationic polymerization: catalysts, mechanism, kinetics. Cationic "living" polymerization. Cationic polymers: polyoxymethylene, polyisobutene, poly(tetrahydrofurane) . 12th week: coordination (stereospecific) polymerization and copolymerization - catalysts, mechanism, kinetics. A coordination polymers: polypropylene, polyisoprene, polybutadiene, ethylene/propylene/diene copolymer. 13th week: the technical implementation of polymerization processes: homogeneous polymerization processes (in mass, in solution) and heterogeneous polymerization processes (in mass, in solution, in the gas phase, suspension polymerization, emulsion polymerization, interfacial polycondensation) 14th week: the industrial plants for production of commodity polymers (polyethylene, polypropylene, poly(vinyl chloride), polystyrene and poly(ethylene terephthalate)) 15th week: final lecture, discussion, conclusions. Continuous assessment (the

<table>
<tr><td></td><td colspan="6">second colloquium).
Laboratory exercises:
Exercise 1. Synthesis of phenol-formaldehyde resin.
Exercise 2. Polyesterification of adipic acid with diethylene glycol.
Exercise 3. Synthesis of modified alkyd resin.
Exercise 4. Suspension polymerization of styrene.
Exercise 5. Emulsion polymerization of vinyl acetate.
Exercise 6. Preparation of poly(vinyl alcohol) by alcoholysis of poly(vinyl acetate).
Exercise 7. Synthesis of polyamide 610 by interfacial polymerization</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
□ seminars and workshops
□ exercises
□ on line in entirety
□ partial e-learning
□ field work</td><td colspan="3">□ independent assignments
x multimedia
x laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Attending lectures in the 80% amount, and laboratory exercises in the 100% amount of the total number of lessons.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training (analysis of experimental results)</td><td>0.3</td></tr>
<tr><td>Experimental work</td><td>1.0</td><td>Report</td><td></td><td>Preparation for laboratory exercises</td><td>0.5</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>0.8</td><td>Oral exam</td><td>0.7</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.7</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td></td><td colspan="5"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous evaluation:
The entire exam can be passed over two colloquium during the semester. Pass threshold for each colloquium is 50%. Each colloquium participates with 35% in a final grade. Laboratory exercises (50-100% success) participate with 20% in a final grade, while attending lectures in 80-100% amount is 10% of a final grade.
Final evaluation:
One passed colloquium (previous activity) is recognized as 10% of a final grade. The remaining part is taken on written and oral exam at prescribed examination terms. Written exam accounts for 30%, oral exam for 40%, while laboratory exercises account for 20% of a final grade, respectively.
Students who did not take or pass colloquiums take written and oral exam at prescribed examination terms. Passing threshold is 50%. Written exam accounts for 40%, oral exam for 40%, while laboratory exercises account for 20% of a final grade, respectively.
Grades definitions and percentages: sufficient (50-61%), good (62-74%), very good (75-87%), excellent (88-100%).</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">Z. Janović, Polimerizacije i polimeri, Hrvatsko društvo kemijskih inženjera i tehnologa, Zagreb, 1997.</td><td>2</td><td>Web pages of Faculty of Chemistry and</td></tr>
</table>

	R. O. Ebewele, Polymer Science and Technology, CRC Press LLC, Boca Raton, 2000.	1	Technology in Split, Croatia
	H. Ulrich, Introduction to Industrial Polymers, Hanser, Munich, 1992.	1	
Optional literature (at the time of submission of study programme proposal)	S. R. Stanley, W. Karo, J. Bonesteel, E. M. Pearce, Polymer Synthesis and Characterization: A Laboratory Manual, Academic Press, San Diego, 1998.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Materials in the construction engineering

NAME OF THE COURSE	**Materials in the construction engineering**					
Code	KTL208	Year of study	2			
Course teacher	Dražan Jozić	Credits (ECTS)	5.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course	Mandatory	Percentage of application of e-learning				

COURSE DESCRIPTION

Course objectives	Acquiring basic theoretical and practical knowledge about the materials used in construction as well as manufacturing process conditions and preparation of composite materials. Acquiring basic Principe about the methods of characterization and protection of materials in the different environment conditions of use.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student will be able to: 1. Prepare samples for standard test procedures in construction materials 2. Conduct tests of physical and chemical parameters essential for mineral binders in accordance with the procedures prescribed standard norms for mineral binders 3. Assess the type of bonding material suitable for use in a variety of application conditions of building materials 4. Prepare mortars and concretes by default specifications 5. Evaluate materials suitable for waterproofing		
Course content broken down in detail by weekly class schedule (syllabus)	1.Week	L	Description and overview of the course contents. Introductory remarks. The division of materials and their properties, Natural materials, Artificial materials, Materials applied as a structural and / or insulating materials
		E	
	2.Week	L	Physical and mechanical properties of materials, Chemical properties

			of the material. Checking the quality of the material.
		E	
	3.Week	L	The basics of building materials (stone, wood, building ceramics, glass, metals, polymeric materials). Mineral binders (air and hydraulic binders). Mortars and plasters.
		E	
	4.Week	L	The processes of thermal decomposition of carbonate and technology of production the lime as mineral binder. Standard test methods and characterization of lime
		E	Preparation of lime and measure the reactivity of lime
	5.Week	L	Technology of production of gypsum, and its application as construction materials, Standard methods for testing gypsum for application as construction materials
		E	
	6.Week	L	The First colloquium
		E	
	7.Week	L	Technology for production of Portland cement. Standards and types of the cements, Chemical and mineralogical composition of the cement.
		E	Determination of the specific surface area, density and particle size of the cement as mineral binder.
	8.Week	L	Cement hydration. Cements for special purposes. Mineral admixtures for cement
		E	Determination of normal consistency, time for start and end of setting time. Determination of constancy of cement composites volume.
	9.Week	L	Chemical additives for cement. The quality control of cement. Cement mortars. Examination of physical properties of mortars
		E	Preparation of cement mortars with and without additives, rheological properties of cement composites (mortar, concrete)
	10.Week	L	The technology of preparation of concrete. Test methods for testing production of concrete and produced hardened concrete. Concrete for special purposes. Aggregates for the preparation of concrete, Production of concrete aggregates, The physical properties of aggregates. Methods of testing aggregates.
		E	Testing of the mechanical properties of cement mortars
	11.Week	L	Resistance cements composites in terms of exposure to aggressive environments. Additives used to increase the durability and stability of the composite materials, Methods of monitoring (monitoring) the condition of structures,
		E	Rapid method of measuring the resistance to penetration of cement composites chloride
	12.Week	L	Clay and clay minerals as mineral raw materials for production of building materials.
		E	Determination of capacity exchange cations (CEC value) of clays minarals
	13.Week	L	Materials suitable for thermal and sound insulation used as construction materials
		E	
	14.Week	L	Waterproofing materials used for protection and decoration of constructions. Techniques and methods of repairing of the buildings.
		E	Adhesion of waterproofing materials on concrete (pull off test)
	15.Week	L	The Second colloquium
		E	
Format of	x lectures		□ independent assignments

<table>
<tr><td>instruction</td><td colspan="3">□ seminars and workshops
x exercises
□ on linein entirety
□ partial e-learning
□ field work</td><td colspan="3">x multimedia
□ laboratory
□ work with mentor
□(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>0.7</td><td>Report</td><td>0.3</td><td>Preparation for experimental work</td><td>0.3</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Independent work</td><td>0.5</td></tr>
<tr><td>Tests</td><td>0.6</td><td>Oral exam</td><td>0.8</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.8</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">The exam can be finished over the two tests during the semester. Minimum for successful tests is the limit of the 50% resolved test. Each test in assessing participates with a share of the 40% of the final grade. Presence at lectures 70-100% participates with a share of the 5% of the final grade while the presence of the laboratory exercises from 100% participates with a share of the 15% of the final grade. The examination periods there is a written and oral exam. Minimum for successful written exam is the limit of the 50% resolved test. Passing one test (previous activity) is valuable in the summer semester examination period with a share of the 15% of the final grade. Written exam has a share of the 25% and verbal has a share of the 40% of the final grade. Students who have not passed any tests during the semester they take the examination through written and oral exams in the regular examination period. Minimum for successful tests the limit of the 50% resolved test. Written part of exam and oral part of exam participates with a share of the 50% of the final grade.
The final grade: 50%-61% - sufficient, 62%-74% - good, 75%-87% very good, 88%-100% - excellent.</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">1. Andrija Đureković; Cement, cementni kompozit i dodaci za beton, Školska knjiga, Zagreb 1996.</td><td>1</td><td></td></tr>
<tr><td colspan="3">2. H.F.W. Taylor; Cement chemistry, 2nd edition, Thomas Telford Publishing, Thomas Telford Services Ltd, London, 1997.</td><td>1</td><td></td></tr>
<tr><td colspan="3">3. Pierre-Claude Aïtcin, Sidney Mindess; Sustainability of Concrete, Spon Press, Oxon 2011.</td><td>1</td><td></td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Selected articles from journals recommended by lecturer</td></tr>
<tr><td>Quality assurance methods that ensure the</td><td colspan="6">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
</table>

acquisition of exit competences	
Other (as the proposer wishes to add)	

Corrosion and metals protection

NAME OF THE COURSE	Corrosion and metals protection					
Code	KTL209	Year of study	2.			
Course teacher	Maja Kliškić	Credits (ECTS)	5.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	After completed course students will have acquired knowledge necessary to prevent corrosion and solve problems caused by corrosion.					
Course enrolment requirements and entry competences required for the course						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After completed course students will be able to: - define and classify corrosion processes - determine the possible application of certain metallic materials in specific corrosive environments - implement the necessary corrosion tests - choose an adequate system of protection against corrosion under specific conditions and assess its durability					
Course content broken down in detail by weekly class schedule (syllabus)	1st week: Definition and importance of corrosion. Classification of corrosion processes. 2nd week: Chemical corrosion. 3rd week: Electrochemical corrosion. Passivity. 4th week: The types of electrochemical corrosion of metals. Corrosion rate. 5th week: Corrosion of metallic materials - influence of the media. 6th week: Corrosion under specific conditions: in the atmosphere, water, sea water. 7th week: Corrosion in the soil. 8th week: Corrosion caused by microorganisms. First test 9th week: Corrosion protection by materials selection and proper designing. 10th week: Materials protection using corrosion inhibitors. 11th week: Electrochemical methods of protection. 12th week: Surface protection. Selection of coatings and paints. 13th week: The importance of inspection and maintenance. 14th week: Corrosion tests. 15th week: Standards. Second test. *Laboratory exercises:* Monitor of atmospheric corrosion**.** Investigations of metals					

<table>
<tr><td></td><td colspan="6">corrosion rate by polarization methods. Determination of critical pitting temperature of stainless steels. Optical microscopy investigations of corroded metal surfaces. Protection of aluminum and its alloys by anodizing and treatment of the oxide film. Determination of efficiency of organic corrosion inhibitors. Cathodic protection by protector (sacrificial anode)</td></tr>
<tr><td>Format of instruction</td><td colspan="3">X lectures
□ seminars and workshops
X exercises
□ on linein entirety
□ partial e-learning
□ field work</td><td colspan="3">□ independent assignments
X multimedia
□ laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Lecture attendance: 80 %. Exercises attendance: 100 %.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.5</td><td>Research</td><td></td><td>Practical training</td><td>1</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>2.5</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">The entire course can be passed by two partial exams during the semester. Passing threshold is 60%. Each partial exam in assessing participates with 40% and exercises with 20%. On examination shedule students will have oral exam. Scoring: <60% insufficient, 61 - 69% - sufficient (2), 70 - 79% - good (3), 80-89% very good (4), 90 - 100% - excellent (5).</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">J.R. Davis, Corrosion – understanding the basic, ASM International, 2000.</td><td>1</td><td colspan="2"></td></tr>
<tr><td colspan="3">B. Jarić, A. Rešetić, Korozija i katodna zaštita, Korexpres, Zagreb, 2003.</td><td>1</td><td colspan="2"></td></tr>
<tr><td colspan="3">I. Esih, Osnove površinske zaštite, Fakultet strojarstva i brodogradnje Sveučilišta u Zagrebu, Zagreb, 2003.</td><td>1</td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">R. Babolan, Corrosion Tests and Standards, Amer. Tech. Pulbl. Ltd. New York, 1995.
P. Marcus, J. Oudar (Eds.), Corrosion Mechanisms in Theory and Practice, M. Dekker, New York, 1995.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

Technology of the pretreatment of raw water

NAME OF THE COURSE	Technology of the pretreatment of raw water						
Code	KTL210	Year of study	2.				
Course teacher	Dražan Jozić	Credits (ECTS)	5.0				
Associate teachers		Type of instruction (number of hours)	L	S	E	F	
			30		30		
Status of the course	Mandatory	Percentage of application of e-learning					

COURSE DESCRIPTION

Course objectives	Acquisition of basic theoretical knowledge about the quality of raw water as well as modern technologies, which are used in the purpose of the preparation raw water for the different industry. Acquiring basic practical knowledge about the management and process control water softening.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student will be able to: - Identify the basic physical and chemical properties of water - Assess according to set requirements on the quality of the feed water softening appropriate procedure - Determine the effectiveness of the technological process of softening water - Apply the means for softening water		
Course content broken down in detail by weekly class schedule (syllabus)	1.Week	L	Introductory lecture and notes related to the course, Water and its physical and chemical properties
		E	
	2.Week	L	Water in nature, Global hydrological cycle of water, Physical and chemical properties of surface and groundwater, Pollution of the ground and surface water. Regulations on water quality
		E	
	3.Week	L	Technical features of water for industry, Technological parameters of water quality, Chemical composition and water modes and interpretation of results, Measurement marks and names
		E	
	4.Week	L	Water as a working fluid in Chemical Engineering, Requirements for water quality in the implementation of technological processes of the chemical industry. General conditions for the quality of the water in heating unit systems, Standards for thermodynamic properties of water (IFC, IAPWS-IF97)
		E	
	5.Week	L	Salts dissolved in the raw water, Defining the hardness of water and salts which makes the water hardness, Units of measure and mark, Methods of determining water quality.
		E	
	6.Week	L	Gases dissolved in the raw water, the possible adverse effects on the process equipment. Methods of the degasification water.
		E	
	7.Week	L	Preparation of process water for thermal power plants, sludge formation and the related negative effects on the process equipment and economy, First test

		E	Laboratory methods for determining physical and chemical properties of the raw water
	8.Week	L	The processes of preparation raw water by application sedimentation process, Theory of the sedimentation, Water softening agents for sedimentation procedures, Methods for control optimal addition of chemicals and implementation process of softening water.
		E	Water treatment by combination of the chemical precipitation processes and filtration process, with the use of the lime as a precipitant in a fast reactor
	9.Week	L	The processes of the preparation of process water chemical clarification, Theoretical fundamentals about the processes and agents for coagulation, agglomeration, sedimentation and flotation, Parameters that affect the implementation process, How to choice of chemicals for clarification, Process Equipment.
		E	Chemical clarification raw waters by application of sedimentation and flocculation process simultaneous together with the process of decarbonization in the accelerator
	10.Week	L	Application of filters devices for the preparation of process water, Types and characteristics of filter cartridge, Effects of application the filter unit, Speed and capacity of filtration, Process equipment for filtration,
		E	
	11.Week	L	Application of ion exchangers in the preparation of process water, Types and classification of ion exchangers. Physical and chemical properties of ion exchangers, How to applied ion exchangers and cycles of lifetime of ion exchangers, Regeneration process of the ionic mass
		E	Softening raw water by using neutral type of the ionic exchangers in the process and regeneration of ion exchange resin.
	12.Week	L	The application of membrane processes for the preparation of process water, Types of membranes and their physical and chemical properties, Industrial application of the process: Reverse osmosis, Electrodeionisation
		E	Demineralization and deionization process waters by using ion exchange
	13.Week	L	How to remove iron, manganese, chloric and oil from the process water, Methods and apparatus for purification
		E	
	14.Week	L	Specific methods of treatment of process water for various purposes disinfection / sterilization by oxidation (Chlorination, Chlorine Dioxide, Ozone, Peroxone ...) and non oxidizing agents (UV radiation, membrane micro and ultra filtration, microfiltration layer), Water disinfection oligodynamically action of heavy metal ions
		E	
	15.Week	L	Second Test
		E	

Format of instruction	x lectures □ seminars and workshops x exercises □ *on line*in entirety □ partial e-learning	□ independent assignments x multimedia □ laboratory □ work with mentor

<table>
<tr><td></td><td colspan="3">□ field work</td><td colspan="3">☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td>1.0</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td>0.3</td><td>Independent work</td><td>0.6</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Consultations</td><td>0.3</td></tr>
<tr><td>Tests</td><td>0.4</td><td>Oral exam</td><td>0.8</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.6</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">The exam can be finished over the two tests during the semester. Minimum for successful tests is the limit of the 50% resolved test. Each test in assessing participates with a share of the 40% of the final grade. Presence at lectures 70-100% participates with a share of the 5% of the final grade while the presence of the laboratory exercises from 100% participates with a share of the 15% of the final grade. The examination periods there is a written and oral exam. Minimum for successful written exam is the limit of the 50% resolved test. Passing one test (previous activity) is valuable in the summer semester examination period with a share of the 15% of the final grade. Written exam has a share of the 25% and verbal has a share of the 40% of the final grade. Students who have not passed any tests during the semester they take the examination through written and oral exams in the regular examination period. Minimum for successful tests the limit of the 50% resolved test. Written part of exam and oral part of exam participates with a share of the 50% of the final grade.
The final grade: 50%-61% - sufficient, 62%-74% - good, 75%-87% very good, 88%-100% - excellent.</td></tr>
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<tr><td colspan="3">1. M. Šivak, Tehnologija pripreme tehničkih voda u termoenergetici, Nakladnička djelatnost Marijan Šivak, Zagreb 2002.</td><td>1</td><td></td></tr>
<tr><td colspan="3">2. Frank Kemer, Nalkov priručnik za vodu, Savez inženjera i tehničara Srbije, Beograd, 2005.</td><td>1</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Selected articles from journals recommended by lecturer</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

Methods for identification of materials

NAME OF THE COURSE	Methods for characterization of materials						
Code	KTL301	Year of study	3.				
Course teacher	Dražan Jozić Sanja Perinović Jozić	Credits (ECTS)	6.0				
Associate teachers		Type of instruction (number of hours)	L	S	E	F	
			30		30		
Status of the course	Mandatory	Percentage of application of e-learning					

COURSE DESCRIPTION			
Course objectives	Acquisition of theoretical knowledge about different techniques and methods for characterization of materials, and practical knowledge about the preparation of samples and the application of simple and advanced instrumental techniques and methods.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After successful completion of the course the student will be able to: 1. optimally use numerous possibilities of individual instruments 2. conclude which instrumental technique and method can be applied to determine predicted properties of materials 3. properly prepare samples and adjust a instrument for a particular measurement, i.e. to calibrate the instrument 4. independently carry out measurements and determine basic parameters of the measured data		
Course content broken down in detail by weekly class schedule (syllabus)	1. week:	L	Introductory notes related to the course. Structure and properties of inorganic, organic and composite materials.
		E	-
	2. week:	L	Development of techniques and methods for characterization of materials throughout the history. Introduction to methods for characterization of materials. The accuracy and precision of the measurement. Statistical deviation of the measurement. Basic terminology in the instrumental characterization of materials (calibration, recalibration, baseline, standards, systematic errors..).
		E	-
	3. week:	L	Physical and chemical properties of materials. Basic notations and terminology.
		E	-
	4. week:	L	Electromagnetic radiation. The interaction of electromagnetic radiation and matter. Instrumental methods and techniques. X-ray radiation. The interaction of X-ray radiation with electrons. The interaction of X-Ray with atoms. Basics of X-ray fluorescence techniques and methods. Calibration and calibration standards of instruments. Interpretation of the results.
		E	Determination of the elemental composition using fluorescence techniques.
	5. week:	L	Basics application of X-ray diffraction on the polycrystalline samples. Determination of the basic parameters of the diffraction pattern. Industrial application diffraction technique and instrument and performance limitations.
		E	Rapid methods for characterization of materials using X-ray diffraction.

	6. week:	L	Assessment of knowledge (I. test). Spectroscopic techniques and methods for characterization of materials. Theoretical background of infrared spectroscopy.
		E	-
	7. week:	L	Basics interactions of infrared radiation with a matter. Important terminology related to infrared spectroscopy and its possible application. Methods suitable for a sample preparation. Methods and techniques of measurement. Practical guidelines for the measurement on infrared spectrometer.
		E	Application of infrared spectroscopy in the characterization of the materials.
	8. week:	L	Theoretical background of ultraviolet-visible spectroscopy. Possible applications of ultraviolet-visible spectroscopy. Sample preparation. Practical guidance for measurement of spectra.
		E	Application of ultraviolet-visible spectroscopy in characterization of materials.
	9. week:	L	Introduction to thermal techniques and methods. Fundamental terminology. Types of thermal techniques and methods. Thermal analysis: Factors which influence on the results.
		E	-
	10. week:	L	Theoretical background of thermogravimetry. Standards for calibration and calibration methods of thermogravimeter and differential thermal analyser. Determination of the baseline and measurement interpretation. Importance of instrument calibration, measurement program, working conditions, preparation of samples. Interpretation of thermogravimetric curves. Possible applications of thermogravimetry (examples). Mistakes that occur in the measurement.
		E	Determination of thermal and thermo-oxidative stability of materials with thermogravimetric method.
	11. week:	L	Assessment of knowledge (II. test). Theoretical background of differential scanning calorimetry and differential thermal analysis. Instrumental designs of these techniques.
		E	-
	12. week:	L	Importance of instrument calibration, measurement program, working conditions, preparation of samples for differential scanning calorimetry and differential thermal analysis. Standards for calibration and recalibration of instruments. Determination of a baseline and measurement interpretation. Possible applications (examples) and possible problems. Mistakes that occur in the measurement.
		E	Determination of thermal properties of material using differential scanning calorimetry.
	13. week:	L	Theoretical background of the thermomechanical analysis and dynamic mechanical analysis. Construction of the thermomechanical system. Calibration of the instrument, measurement program, working conditions, sample preparation, etc. Thermomechanical curves. Possible applications (examples) and possible problems/solution.
		E	-
	14. week:	L	Construction of dynamic mechanical system. Calibration of the instrument, measurement program, working conditions, sample preparation, etc. Dynamic mechanical curves. Possible applications (examples) and possible problems/solution.
		E	-
	15. week:	L	Repetition of course content. Assessment of knowledge (III. test).
		E	-

<table>
<tr><td>Format of instruction</td><td colspan="6">x lectures
□ seminars and workshops
x exercises
□ on line in entirety
□ partial e-learning
□ field work</td><td colspan="6">□ independent assignments
x multimedia
x laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="12">Class attendance in the amount of 70% to 100%, and to experimental work of 100% from total hours.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td colspan="2">Class attendance</td><td>1.0</td><td>Research</td><td></td><td colspan="2">Practical training</td><td></td></tr>
<tr><td colspan="2">Experimental work</td><td>1.0</td><td>Report</td><td>0.5</td><td colspan="2">Preparation for experimental work</td><td>0.6</td></tr>
<tr><td colspan="2">Essay</td><td></td><td>Seminar essay</td><td></td><td colspan="2">Independent work</td><td>0.5</td></tr>
<tr><td colspan="2">Tests</td><td>0.8</td><td>Oral exam</td><td>0.8</td><td colspan="2">(Other)</td><td></td></tr>
<tr><td colspan="2">Written exam</td><td>0.8</td><td>Project</td><td></td><td colspan="2">(Other)</td><td></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="12">The entire exam can be passed over three tests during the semester. Minimum for successfully passed tests is limit of 50% of resolved test. Each test participates with a share of 25% in total grade. During the regular examination period students pass the exam over a written and oral exam. Minimum for passage is 50% of resolved test. Each previously passed test (previous activity) is valid only in the summer examination period with a share of 10% in total grade. The written exam participates with 20% (two previously passed tests) and 30% in total grade (one previously passed test), while the oral exam participates with a share of 35% in total grade. For students who will take the exam during the regular examination period only through the written and oral exam limit for passage is 50% of resolved test. The written exam participates with a share of 35% in total grade while the oral exam participates with a share of 40% in total grade.
Class attendance in the amount of 70% to 100% presents the share of 10% in total grade, while the implementation of experimental work of 100% presents the share of 15% in total grade.
Grading: 50%-61% - sufficient, 62%-74% - good, 75%-87% very good, 88%-100% - excellent.</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td colspan="8">Title</td><td colspan="2">Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="8">1. H. Günzler and H. Gremlich, Uvod u infracrvenu spektroskopiju, Školska knjiga Zagreb, 2006.</td><td colspan="2">1</td><td></td></tr>
<tr><td colspan="8">2. T. Kovačić, Struktura i svojstva polimera, Sveučilište u Splitu, Split, 2010.</td><td colspan="2">1</td><td></td></tr>
<tr><td colspan="8">3. Michael E. Brown, Introduction to Thermal Analysis, Techniques and Applications (2nd edition), Kluwer Academics Publishers, New York, 2004.</td><td colspan="2">1</td><td></td></tr>
<tr><td colspan="8">4. B.E. Warren, X-Ray diffraction, Dover Publications, New York, 1990.</td><td colspan="2">1</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="12">1. Roger N. Clark, Spectroscopy of Rocks and Minerals, and Principles of Spectroscopy, John Wiley and Sons, Inc, New York, 1999.
2. Selected articles from journals recommended by lecturer</td></tr>
<tr><td>Quality assurance</td><td colspan="12">- monitoring of students suggestions and reactions during semester</td></tr>
</table>

methods that ensure the acquisition of exit competences	- students evaluation organized by University
Other (as the proposer wishes to add)	

Polymeric materials

NAME OF THE COURSE	POLYMERIC MATERIALS					
Code	KTL302	Year of study	3.			
Course teacher	Branka Andričić	Credits (ECTS)	6.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		25	5
Status of the course	Mandatory	Percentage of application of e-learning	-			
COURSE DESCRIPTION						
Course objectives	Gaining the basic theoretical and practical knowledge on polymeric materials, their properties and application.					
Course enrolment requirements and entry competences required for the course	Polymerization processes - enrolled.					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After the successfully passed exam student is able to: - explain the temperature dependent behaviour of polymers - differentiate the solubility of polymers vs. low-molecular substances - identify conventional plastics on the base of their physical properties - place the certain polymer in the pyramid of polymeric materials - recognize the resources and application of naturally occurring polymers - be acquainted with basic components of polymer blends and composites in order to prepare blends and composites - explain the causes of polymer degradation.					
Course content broken down in detail by weekly class schedule (syllabus)	1st week: Introduction to polymers. Plastics in modern world. History of polymers development. General terms in polymers chemistry. 2nd week: Molecular structure of polymers: configuration and conformations. Supermolecular structure of polymers. 3rd week: Physical properties and deformations of polymers. Thermomechanical curve. Mechanical properties. Stress-strain curves. 4th week: Solubility of polymers. Swelling of polymers. Polyelectrolytes and ionomers. 5th week: Resource based classification of polymers. Synthetic polymers based polymeric materials: manufacture, application, pyramid of polymers. 6th week: E, EVA, PP, PVC: properties and application. 7th week: PS: homopolymers, copolymers and terpolymers, cellular PS, properties and application. First test.					

	8th week: Principles of impact strength modification using styrene terpolymers. PET, PAs and other polymers. Thermosets: epoxide resins, unsaturated polyester resins, vinyl-ester resins. 9th week: Phenol-formaldehyde resins. Thermosets hardening reactions. Elastomers. Thermoplastic elastomers. Naturally occurring polymers. Cellulose and its derivatives. 10th week: Starch and other polysaccharides. Proteins: structure and conformations. Natural rubber and its derivatives. Vulcanization. Rubber products (tyres, expanded rubber etc.) 11th week: Inorganic polymers. Liquid crystalline polymers. Biodegradable polymers. High-temperature polymers. Fibers: cellulose fibers. 12th week: Modified cellulose fibers. Protein fibers. Synthetic fibers. Behavior of fibers on burning. Adhesives. Surface coatings. 13th week: Additives in polymeric materials. Degradation of polymers. Heat and photo stabilizers. Antioxidants. Plasticizers. Antistatic agents. 14th week: Polymer blends. Composites with polymer matrix. Plastic and rubber recycling. 15th week: Second test. Laboratory exercises: Solvents and non-solvents for polymers. Swelling of polymers. Density determination. PVC modification. Separation and identification of components in polymeric materials. Identification of natural and synthetic polymers by burning tests. Preparation of casein glue.
Format of instruction	X lectures □ seminars and workshops □ exercises □ *on line* in entirety □ partial e-learning X field work □ independent assignments x multimedia X laboratory □ work with mentor ☐(other)
Student responsibilities	Lecture attendance: 80 %. Laboratory exercises attendance: 100 %.

Screening student work*(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	1.0	Research		Practical training	0.5
	Experimental work	1.0	Report		Exercises tests study (Other)	0.5
	Essay		Seminar essay		Field work (Other)	0.5
	Tests	0.9	Oral exam	0.8	(Other)	
	Written exam	0.8	Project		(Other)	

Grading and evaluating student work in class and at the final exam	The complete exam can be passed through two tests during semester. The passing score is 50 % and the fraction of each test is 35 %. The fraction of laboratory exercises (successfulness 50-100%) is 20% in all cases. Attendance on lectures (80-100%) is further 10 % of final grade. In the exam period the student has to attend to written and oral exam (passing score is 50 %). Previous activity (one passed test) is valid in the winter exam period with fraction of 10%. Written exam is 30% and oral exam is 40% of final grade. Students without any successful previous activity attend to written and oral exam (passing score is 50 %) both with fraction of 40%. Grades: successful (50% – 61 %), good (62% – 74 %), very good (75% – 87 %), excellent (88% – 100 %).

Required literature (available in the	**Title**	**Number of copies in**	**Availability via other media**

library and via other media)		**the library**	
	Z. Janović, Polimerizacije i polimeri, HDKI-Kemija u industriji, Zagreb, 1997.	5	
	B. Andričić, Prirodni polimerni materijali, Priručnik, Sveučilište u Splitu, Split, 2008.	1	Web site of institution
	I. M. Campbell, Introduction to Synthetic Polymers, Oxford Univ. Press, Oxford, 2000.	1	
Optional literature (at the time of submission of study programme proposal)	T. A. Oswald, G. Menges, Material Science of Polymers for Engineers, Hanser Publ., Munich, 1995.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Industrial wastewaters

NAME OF THE COURSE	**Industrial wastewaters**					
Code	KTL303	Year of study	3.			
Course teacher	Nediljka Vukojević Medvidović	Credits (ECTS)	6.0			
Associate teachers		Type of instruction (number of hours)	P	S	V	T
			30	15	27	3
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	Students get to know the source and types of wastewaters, the indicators of their pollution, wastewater treatments and the methods of wastewater sludge disposal.					
Course enrolment requirements and entry competences required for the course	-					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	It is expected that the outcome of learning to provide knowledge about: - wastewater treatment and relationship with sustainable development - sources and types of waste water and their characteristics - processes of the preliminary, first, second and third phase of wastewater treatment - selection of processes of wastewater treatment based on wastewater characteristics and composition - biogas production and its useful application - disposal of sludge remain after treatment of wastewater from different industries - natural wastewater treatment systems - legislation related to wastewater treatment					

Course content broken down in detail by weekly class schedule (syllabus)	1st week: Water importance for human. Water use. Water distribution on the Earth. Hydrological cycle. Importance of hydrological cycle on recovery of water source. Seminar with examples of purification of waste water from different industries is given to students. 2nd week: Fresh water supply on Earth. The impact of anthropogenic activities on the hydrological cycle. Water and sustainable development. Contamination and pollution of natural water. 3rd week: Wastewater pollution indicators. Point and nonpoint source of pollution. 4th week: Urban wastewater. Industrial wastewater. (I written evaluation) 5th week: Cooling wastewater. Rainfall wastewater. Leachate wastewater from landfill. Calculation of the wastewater loading with harmful substances expressed as population equivalent (PE) 6th week: Physical, chemical and biological process of autopurfication. Disorders of aquatic ecosystems. Eutrophication. 7th week: Wastewater treatment. Preliminary and first phase of wastewater treatment 8th week: Second phase of biological wastewater treatment. Aerobic processes. (II written evaluation) 9th week: Performance of aerobic process. Anaerobic processes. Third phase of wastewater treatment. Natural wastewater treatment systems. 10th week: Treatment and disposal of sludge. 11th week: Seminar- Legislation related to wastewater treatment: Water Act (NN 153/09, 130/11, 56/13), Regulation on water classification (NN 77/98 i 137/08), State water protection plan (NN 08/99), Regulation on hazardous substances in water (NN 78/98 i 137/08) Regulation on limit values and other hazardous substances in water (NN 40/99, 94/08), Regulation on limited values of emission in wastewater (80/13). (III written evaluation) 12th week: Seminar: Technological solution of wastewater treatment from different industries (beer production, production and processing of meat and meat products, fish processing and dairy industry) 13th week: Seminar: Technological solution of wastewater treatment from different industries (pulp and paper industries, textile industries, chemical industries) 14th week: Seminar: Technological solution of urban wastewater treatment from different cities such as Zagreb, Split and Zadar 15th week: Seminar: Oral presentation of student seminars (IV oral evaluation) Exercise 1-Determination of basic physical and physical-chemical parameters in wastewater samples. Exercise 2-Determination of chemical oxygen demand (COD) using dichromate method. Exercise 3-Determination of biochemical oxygen demand (BOD) using Winkler method. Exercise 4-Treatment and removal of dissolved substance of heavy metals - zinc ions removal from wastewater by neutralization and precipitation. Exercise 5-Effect of adding demulsifies and dewatering agent on separation of phase from oily wastewater. Exercise 6-Characterisation of bioactive sludge: sedimentation of active sludge in Imhofe and determination of mixed liquor suspended solids (MLSS) of active sludge Fieldtrips for visiting of wastewater treatment plants.	
Format of	**x** lectures	□ independent assignments

<table>
<tr><td>instruction</td><td colspan="3">x seminars and workshops
x exercises
□ on linein entirety
□ partial e-learning
x field work</td><td colspan="3">x multimedia
x laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Attending lectures is 80%, while seminars, laboratory exercises and field work 100% of the total hours.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2.5</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.2</td><td>Report</td><td>0.3</td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>0.5</td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>0.5</td><td>Oral exam</td><td>0.5</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.5</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Every laboratory exercises include oral exam before exercise and writing of final report. The entire exam can be applied over the three written evaluation and one oral evaluation of seminar during the semester. Passing threshold is 60%. Students who have not passed evaluation during the semester should attend at the final exam in the regular examination period. Final exam will include written and oral exam. Passing threshold is also 60%. Rating: 60% -70% - satisfactory, 70% -80% - good, 80% -90% very good, 90% -100% - excellent.</td></tr>
<tr><td rowspan="11">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">D. Hendricks, Water treatment unit processes, Taylor and Francis Group, Boca Raton, 2006.</td><td>1</td><td colspan="2">-</td></tr>
<tr><td colspan="3">Metcalf & Eddy, Wastewater Engineering, Irwin McGraw-Hill, New York, 1991.</td><td>1</td><td colspan="2">-</td></tr>
<tr><td colspan="3">B. Tušar, Pročišćavanje otpadne vode, Kigen d.o.o. i Geotehnički fakultet Sveučilišta u Zagrebu, Zagreb, 2009.</td><td>1</td><td colspan="2">-</td></tr>
<tr><td colspan="3">B. Tušar, Ispuštanje i pročišćavanje otpadne vode, Croatia knjiga, Zagreb, 2004.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3">S. Tedeschi, Zaštita voda, HDGI, Zagreb, 1997.</td><td>1</td><td colspan="2">-</td></tr>
<tr><td colspan="3">J. Margeta: Oborinske i otpadne vode: teret onečišćenja i mjere zaštite; Sveučilište u Splitu, Građevinsko-arhitektonski fakultet, Split, 2007.</td><td>1</td><td colspan="2">-</td></tr>
<tr><td colspan="3">J. Perić, N. Vukojević Medvidović, I. Nuić, Inženjerstvo otpadnih voda, Priručnik za laboratorijske vježbe, Kemijsko tehnološki fakultet Sveučilišta u Splitu, lipanj 2012. (http://www.ktf-split.hr/bib/nm/inzenjerstvo_otpadnih_voda.pdf).</td><td>-</td><td colspan="2">web</td></tr>
<tr><td colspan="3">Scientific and professional paper in the field of wastewater treatment.</td><td>-</td><td colspan="2">-</td></tr>
<tr><td colspan="3">Laboratory exercises in industrial wastewater (internal script).</td><td>-</td><td colspan="2">web</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme</td><td colspan="6">R.T. Wright and B.J. Nebel, Environmental Science, 9th edition, Prentice Hall Inc, New Jersey, 2004.
L.D. Benefield, et al., Process Chemistry for Water and Wastewater Treatment, Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1982.</td></tr>
</table>

proposal)	
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University
Other (as the proposer wishes to add)	-

Coatings

NAME OF THE COURSE	Coatings					
Code	KTL304	Year of study	3			
Course teacher	Nataša Stipanelov Vrandečić	Credits (ECTS)	6.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		25	5
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	Gaining the basic theoretical and practical knowledge on structure and characteristics of paint and surface coatings, industrial paint-making processes, as well as on application of coatings in different fields.					
Course enrolment requirements and entry competences required for the course						
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After the successfully passed exam student should be able to: - define types and functions of coatings - list components of coatings and to explain its characteristics - describe manufacturing process of coatings - explain importance of rheological characteristics of coatings - perform experiment and measurement in laboratory and to interpret collected data - participate in team work and to present results of project					
Course content broken down in detail by weekly class schedule (syllabus)	1st week: Introduction: characteristics, definitions and historical development of coatings, 2nd week: Classification and application of coatings. Composition of coating and role of basic components. 3rd week: Binders: Natural polymers, Oils and fatty acids, Oleoresinous media 4th week: Alkyd resins, Polyurethane and urethane alkyd, 5th week: Acrylic polymers, Amino resins 6th week: Phenol-formaldehyde resins, Epoxy resins, Polyester resins 7th week: Vinyl polymers, Silicone resins, Chlorinated rubber 8th week: Emulsion and dispersion polymers, Non-aqueous dispersion polymers, Water-borne systems Written test (first) 9th week: Resins for electrodeposition, High solids coatings, Radiation-curing coatings, Powder-coatings compositions. 10th week: Pigments: required qualities of pigments, pigment classification,					

<table>
<tr><td></td><td colspan="6">particulate nature of pigments and the dispersion process, corrosion-inhibiting pigments.
11th week: Solvents and thinners, solvent power, solubility parameters, solvent effect on viscosity, evaporation solvent from coatings
12th week: Additives for coatings
13th week: Industrial paint-making process, methods of dispersion and machinery
14th week: Rheological properties of coatings: definitions, solution and dispersion viscosity, viscosity of polymer solutions,
15th week: Rheology of coatings during manufacture, storage and application, Methods of coating application.
Written test (second)
Laboratory exercise:
1. Synthesis of polymer suitable as resin for organic coating; Analysis of raw materials and product
2. Analysis of alkyde and acrylic coatings by FT-IR spectroscopy
3. Analysis of coating by DSC
4. Determination of volatile matter in coatings
5. Determination of thermal stability of coatings by TG</td></tr>
<tr><td>Format of instruction</td><td colspan="3">X lectures
□ seminars and workshops
X exercises
□ on linein entirety
□ partial e-learning
xfield work</td><td colspan="3">□ independent assignments
X multimedia
X laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>2.0</td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>3.0</td><td>Oral exam</td><td>(1.5)</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>(1.5)</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">CONTINUOUS EVALUATION
The complete exam can be passed through two partial tests during semester.
Attendance on lectures, A_1(successfulness =70 -100 %), share in grade, k_1 =0,10
Laboratory exercises, A_2(successfulness =50 -100 %), share in grade, k_2 =0,20
1st test, A_3 (successfulness =60 -100 %), share in grade, k_3 =0,35
2nd test, A_4 (successfulness =60 -100 %), share in grade, k_4 =0,35
GRADE (%) = $0,10A_1+0,20A_2 + 0,35A_3+ 0,35A_4$
FINAL EVALUATION
Students who did not take or pass partial tests have to attend to written and oral exam in the regular exam periods.
Activities A1 and A2 are evaluated in the same way as indicated above.
Written exam, A_5 (successfulness =60 -100 %), share in grade, k_5 =0,20
Oral exam, A_6 (successfulness =60 -100 %), share in grade, k_6 =0,40
GRADE (%) = $0,10A_1+0,15A_2 + 0,20A_5 + 0,40A_6$
FINAL GRADE: successful (50% – 61 %), good (62% – 74 %), very good (75% – 87 %), excellent (88% – 100 %).
In the case that student passed only one test during continuous evaluation, he/she have to attend to written and oral exam in the regular exam periods. The passed test will be recognized by the end of the academic year as a part of the written exam.</td></tr>
</table>

	Title	Number of copies in the library	Availability via other media
Required literature (available in the library and via other media)	N. Stipanelov Vrandečić, Coatings, (lecturers handouts)		CD-ROM
	I R. Lambourne and T.A. Strivens (Edit.), Paint and surface coatings, Woodhead publishing Ltd., Cambridge, 1999.	1	
	D, Stoye and W. Freitag, Resins for Coatings, Hanser Publisher, Cincinnati, 1996.	1	
Optional literature (at the time of submission of study programme proposal)	Z. Janović: Polimerizacije i polimeri, Hrvatsko društvo kemijskih inženjera i tehnologa , Zagreb, 1997		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Durability of non-metallic materials

NAME OF THE COURSE	Durability of non-metallic materials					
Code	KTL305	Year of study	3			
Course teacher	Jelica Zelić	Credits (ECTS)	6.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		26	4
Status of the course	Mandatory	Percentage of application of e-learning	-			
COURSE DESCRIPTION						
Course objectives	Acquiring basic theoretical knowledge about the processes of decay and corrosion in the resistance and durability assessment of commercial inorganic non-metallic materials under natural conditions of their application					
Course enrolment requirements and entry competences required for the course	Materials in cnstruction engineering, Corrosion and protection of metals					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student is expected to know: - Distinguish the mechanism of corrosion of metals and non-metals - Categorize the types of chemical corrosion of concrete, mortar and cement composites as a result of the interaction of concrete (mortar, cement composite) and aggressive environment - A model to explain the chemical action of seawater on concrete or reinforced concrete					

	- Assess the impact of atmospheric corrosion and deterioration of technical and decorative stone - To predict the effects of alkali-aggregate reaction - Assess the impact of pozzolanic additives and other additives (for example, finely ground limestone) on the prevention of corrosion and improve the durability of concrete, mortar and cement composites - Explain the process of wear and / or corrosion of technical glass surface under the influence of atmospheric - Apply the methods of testing the impact of the aggressive environment on the durability of structures - Evaluate and propose protection measures in order to improve the durability of selected inorganic non-metallic materials.
Course content broken down in detail by weekly class schedule (syllabus)	1st week : Description and view the contents of the case. Economic and ecological significance of material protection. Types of corrosion and destructive phenomena in corrosion of metals and non-metals. 2nd week : Technical important non-metallic inorganic materials . The relationship of the structure and properties of materials in the evaluation of their resistance and durability of the natural conditions of their application. 3rd week : Influencing factors in the breakdown structure of concrete , mortar and cement composites . Types and mechanisms of chemical corrosion depending on the aggressive environment. 4th week : Chemical corrosion in soil , seawater and process industry . Selected examples of chemical corrosion betoba and reinforced concrete structures. Sulfuric corrosion, products and effects of concrete corrosion 5th week : Influence of cement , sulphate concentrations , types of cations bonded to the sulfate ion , temperature and exposure time on corrosion rate of concrete. 6th week : Test methods . Protection measures in practice . 7th week : New composite materials with high corrosion resistance and durability .Repetition of material . Examination (I colloquium) . 8th week : Rocks. Definition. Division. The structure of the stone and the application 9th week : Influencing factors in the breakdown of the structure of technical and decorative stone . Types and mechanisms of chemical corrosion depending on the aggressive environment . Alkali- silica reaction . Causes and consequences . 10th week : Chemistry emergence of "black crust " on the rock carbonate origin (limestone, marble) and wear of the stone under the influence of environmental factors (H_2O , SO_2 , CO_2 , soot) . Mediterranean patina . Hypothesis formation. 11th week : Test methods . Protection measures in practice. 12th week : Glass. Definition. Composition of technical glass. Holders of the structure and types of technical glass. 13th week : The kinetics and mechanism of wear and / or corrosion of the glass surface by weathering . Hydration and hydrolysis of Na- silicate glass. 14th week : Hydrolytic resistance of glass . Test methods. Protection measures. 15th week : Repetition . Examination (II colloquium). EXERCISES : 1. Determination of sulphate resistant cement mortar samples in a solution of Na_2SO_4

<table>
<tr><td></td><td colspan="6">a) without replacement supplements
b) to the alternate addition of siliceous
c) to the alternate addition of finely ground limestone
by measuring the strength (compressive and flexural) cement mortar , modulus of elasticity, volume due to swelling, and amounts of the unleached calcium hydroxide.
2. Determination of sulphate resistant cement mortar samples in a solution of $MgSO_4$
a) without replacement supplements
b) to the alternate addition of siliceous
c) to the alternate addition of finely ground limestone
by measuring the strength (compressive and flexural) cement mortar, modulus of elasticity, volume change due to swelling, and amounts of the unleached calcium hydroxide.
3. Determination portlandita methods of thermal analysis (DTA / TG) in the hydrated cement mortar samples with and without pozzolanic additions.
4. Testing effect of acid on different types of rocks. Testing of alkali - aggregate reaction.
5. Characterization of " Mediterranean patina " on the rock carbonate origin FTIR method.
6. Determination of hydraulic resistance of technical glass.
7. Visual observation of objects on the ground, and field trials.
8. Seminar essay</td></tr>
<tr><td>Format of instruction</td><td colspan="3">X lectures
☐ seminars and workshops
X exercises
□ on linein entirety
□ partial e-learning
X field work</td><td colspan="3">X independent assignments
X multimedia
□ laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.0</td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>1.0</td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>1.0</td><td>Oral exam</td><td>1.0</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>1.0</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">The entire test can be applied over two exams during the semester. Passing threshold is 60%. Each colloquium in assessing participates with 45%. Lectures presence of 80 to 100% is 10% marks. The examination periods there is a written and oral exam. Passing threshold is 60%. Passing one colloquium (previous activity) is true in the summer examination period with a share of 10% in the assessment. Written exam has a share of 40% and 50% verbal. Students who have not passed the exam by tests take the examination through written and oral exams in the regular examination period. Passing threshold is 60% and the examination form to participate in the evaluation by 50%.
Rating: 60% -70% - satisfactory, 71% -81% - good, 82% -92% very good, 93% - 100% - excellent.</td></tr>
<tr><td>Required literature</td><td colspan="4">Title</td><td>Number of</td><td>Availability via</td></tr>
</table>

(available in the library and via other media)		**copies in the library**	**other media**
	J. Zelić, Z. Osmanović, Strength and Durability of the Cement Composites/Čvrstoća i trajnost cementnih kompozita, Manualia Universitatis Studiorum Spalatensis, University of Split, Split, 2013, peer review	1	www.ktf-split.hr
	J. Zelić, Practicum in the processes of inorganic industry /Praktikum iz procesa anorganske industrije, Faculty of Chemical and Technology in Split, Split, 2013 (reviewed teaching materials), http:// www.ktf-split.hr/bib/nm/Procesi _anorganske_ industrije.pdf	1	www.ktf-split.hr
	Z. Osmanović, J. Zelić, Production of Portland Cement /Proizvodnja Portland-cementa, Manualia Universitatis Studiorum Tuzlaensis, University of Tuzla, Tuzla, 2011. http://www.knjiga.ba/proizvodnja_portlandj_cementa -k7412.html	5	www.knjiga.ba
Optional literature (at the time of submission of study programme proposal)	1. J. Zelić, Engineering of Selected Inorganic Materials, (in English), Manualia Universitatis Studiorum Spalatensis, University of Split, Split, 2013, peer review 2. J. Zelić, Engineering of Selected Inorganic Materials (in English), Faculty of Chemical and Technology in Split, Split, 2013 (reviewed and edited teaching materials), http:// www.ktf-split.hr/bib/nm/Inzenjerstvo _odabranih_ anorganskih_materijala_en.pdf 3. R. A. McCauley, Corrosion of Ceramics Materials, 3rd Ed., CRC Press, 2013.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Solid waste and recycling

NAME OF THE COURSE	**Solid waste and recycling**					
Code	KTL306	Year of study	3.			
Course teacher	Ladislav Vrsalović	Credits (ECTS)	5.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		10	5
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	Students will get the basic knowledge about environmental pollution with solid					

<table>
<tr><td></td><td colspan="6">waste, the causes of its formation and its impact on the environment. They will also learn about the possibilities of solving the waste problems by separating the components of solid waste that can be used as raw materials for production of new usable products or energy production.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6"></td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">After passing the exam the student is expected to know:
- Distinguish types of solid waste.
- Compare methods of waste segregation.
- Present ways of utilization of various types of waste.
- Interpret waste management legislation in Croatia.
- Describe the basic features of communal landfills.</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">1st week: Introduction. Definition of waste and basic terms related to waste. Types and distribution of solid waste.
2nd week: Hazardous waste.
3rd week: Transfer of pollutants through the soil and its interaction with the soil.
4th week: Collection, transport, separation and mechanical processing of solid waste.
5th week: Getting usable materials from solid waste. Direct recycling and recycling systems.
6th week: Sanitary waste disposal. Composting.
7th week: Thermal treatment and pyrolysis. (I. partial written exam).
8th week: Energy production from solid waste.
9th week: Production of ethanol end methane from biomass.
10th week: Processing of waste from agro-industry and agriculture. Waste disposal from forestry.
11th week: Management of the pesticides packaging waste.
12th week: Recycling of paper and textile materials.
13th week: Tyres recycling.
14th week: Electrical and electronic waste. Automobile and household batteries.
15th week: Landfills. (II partial writen exam)
LABORATORY EXERCISES:
The beneficial use of citrus peel. Production of ethanol by distillation of fermented grape marc. Production of calcium tartarate. Processing the recycled paper. Separation and recycling of metallic materials. Fieldwork on landfill Karepovac.</td></tr>
<tr><td>Format of instruction</td><td colspan="3">× lectures
□ seminars and workshops
× exercises
□ on line in entirety
□ partial e-learning
× field work</td><td colspan="3">□ independent assignments
× multimedia
× laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Attending lectures in the amount of 80%. Laboratory exercises 100 %.</td></tr>
<tr><td rowspan="4">Screening student work(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.0</td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>1.0</td><td>Oral exam</td><td>1.0</td><td>(Other)</td><td></td></tr>
</table>

equal to the ECTS value of the course)	Written exam	1.0	Project		(Other)	
Grading and evaluating student work in class and at the final exam	The entire course can be passed by two partial exams during the semester. Passing threshold is 50%. Each partial exam in assessing participates with 50%. On examination shedule students will have oral exam. Scoring: <50% insufficient, 50%-60% - sufficient, 61% -74% - good, 75% -87% very good, 88% -100% - excellent.					
Required literature (available in the library and via other media)	**Title**			**Number of copies in the library**	**Availability via other media**	
	G. Tchobanoglous, F. Kreith, Handbook of solid waste management, McGraw-Hill, New York, 2002.			1		
Optional literature (at the time of submission of study programme proposal)	S. Kalambura, T. Krička, D. Kalambura, Gospodarenje otpadom, Veleučilište Velika Gorica, 2011. N. P. Cheremisinoff, Handbook of solid waste management and waste minimization technologies, Butterworth Heinemann, USA, 2003. M. Kliškić, Kruti otpad i recikliranje, upute za vježbe, Kemijsko-tehnološki fakultet u Splitu, Split 2000.					
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University					
Other (as the proposer wishes to add)						

Processing and recycling of polymers

NAME OF THE COURSE	**Processing and recycling of polymers**					
Code	KTL307	Year of study	3.			
Course teacher	Matko Erceg	Credits (ECTS)	6.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		15	15
Status of the course	Mandatory	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	- Understanding the modern polymer processing procedures - Understanding the modern methods of polymer waste recovery - The application of acquired knowledge in finding optimal solutions in the processing and recycling of polymers					
Course enrolment requirements and entry competences required for the course	None.					
Learning outcomes	After passing the exam the student is expected to:					

expected at the level of the course (4 to 10 learning outcomes)	- understand the properties and behavior of the polymer during processing and application - explain the importance of polymer additives - describe the main polymer processing procedures - identify and classify components of plastic waste - differentiate between material and energy recovery of polymer waste - select the optimal methods of waste recovery - conclude on the importance of polymers in modern society	
Course content broken down in detail by weekly class schedule (syllabus)	1st week: types of polymers. Polymer processing properties (thermal properties). 2nd week: polymer processing properties - continued (mechanical properties, rheology). 3rd week: additives for polymers. 4th week: primary shaping procedures: continuous (extrusion, calendering and coating). 5th week: primary shaping procedures: discontinuous (compression moulding, transfer moulding, injection moulding, casting, sintering). 6th week: secondary shaping procedures: warm and cold secondary shaping, blowing, drawing, shrinkage. Bonding, welding. 7th week: surface improvement of plastics. Production of foamy and reinforced polymer products. Environmental impacts of plastic production stage. 8th week: continuous assessment (the first colloquium). Global consumption of polymers and environmental impacts of plastic products using stage. Polymers and sustainable development. 9th week: labeling polymer products. Types of plastic waste. Homogeneous and heterogeneous plastic waste. Compatibility of polymers. 10th week: sorting procedures (plastic from other waste, plastic-plastic separation). 11th week: size reduction of plastic waste. Mechanical recycling. Primary and secondary recycling of plastic waste. 12th week: recycling of homogeneous and heterogeneous plastic waste. Chemical recycling. Solvent recycling. 13th week: energy recovery. Biodegradation. Behavior of plastic waste in the landfill and compost. Environmental impacts of the plastic recycling. 14th week: LCA (Life Cycle Assessment) method. 15th week: final comments, discussion, conclusions. Continuous assessment (the second colloquium). Laboratory exercises : Exercise 1. Manual sorting of plastic packaging waste. Exercise 2. Sorting of plastic waste by float-sink method . Exercise 3. Sorting of plastic waste by infrared spectroscopy . Exercise 4. Effect of repeated recycling the thermal properties of polymers. Exercise 5. Chemical recycling of poly (ethylene terephthalate). Exercise 6. Separation and identification of additives in polymeric material. Field work: visit to factories AD Plastik Inc., Solin and Fornix Ltd. , Dugi Rat	
Format of instruction	x lectures □ seminars and workshops □ exercises □ *on line* in entirety □ partial e-learning x field work	□ independent assignments x multimedia x laboratory □ work with mentor ☐(other)
Student responsibilities	Attending lectures in the 80% amount, and laboratory exercises in the 100%	

<table>
<tr><td></td><td colspan="6">amount of the total number of lessons.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training (analysis of experimental results)</td><td>0.4</td></tr>
<tr><td>Experimental work</td><td>1.0</td><td>Report</td><td></td><td>Preparation for laboratory exercises</td><td>0.4</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Field work</td><td>0.4</td></tr>
<tr><td>Tests</td><td>1.0</td><td>Oral exam</td><td>0.8</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>1.0</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous evaluation:
The entire exam can be passed over two colloquium during the semester. Pass threshold for each colloquium is 50%. Each colloquium participates with 35% in a final grade. Laboratory exercises (50-100% success) participate with 20% in a final grade, while attending lectures in 80-100% amount is 10% of a final grade.
Final evaluation:
One passed colloquium (previous activity) is recognized as 10% of a final grade. The remaining part is taken on written and oral exam at prescribed examination terms. Written exam accounts for 30%, oral exam for 40%, while laboratory exercises account for 20% of a final grade, respectively.
Students who did not take or pass colloquiums take written and oral exam at prescribed examination terms. Passing threshold is 50%. Written exam accounts for 40%, oral exam for 40%, while laboratory exercises account for 20% of a final grade, respectively.
Grades definitions and percentages: sufficient (50-61%), good (62-74%), very good (75-87%), excellent (88-100%).</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">A. Rogić, I. Čatić, D. Godec, Polimeri i polimerne tvorevine, Društvo za plastiku i gumu, Zagreb, 2008.</td><td>2</td><td colspan="2" rowspan="4">Web pages of Faculty of Chemistry and Technology in Split, Croatia</td></tr>
<tr><td colspan="3">A. Azapagic, A. Emsley, I. Hamerton, Polymers, The Environment and Sustainable Development, Wiley, 2003.</td><td>1</td></tr>
<tr><td colspan="3">M. Šercer, D. Opsenica, G. Barić, Oporaba plastike i gume, mtg topograf d.o.o., Zagreb, 2000.</td><td>1</td></tr>
<tr><td colspan="3">J. Scheirs, Polymer Recycling: Science, Technology and Applications, John Wiley&Sons, Chichester, 1998.</td><td>1</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">I. Čatić, F. Johannaber, Injekcijsko prešanje polimera i ostalih materijala, Društvo za plastiku i gumu, Zagreb, 2004.; H. F. Gilles, Jr., J. R. Wagner, Jr., E. M. Mount, III., Extrusion: The Definitive Processing Guide and Handbook, William Andrew, Inc., New York, 2005.; L. Lundquist, Y. Leterrier, P. Sunderland, J.E. Manson, Life Cycle Engineering of Plastics, Elsevier, Oxford, 2000.; A. L. Andrady, Plastics and the Environment, Wiley-Interscience 2003.; Z. Janović, Polimerizacije i polimeri, Hrvatsko društvo kemijskih inženjera i tehnologa, Zagreb, 1997.</td></tr>
<tr><td>Quality assurance methods that</td><td colspan="6">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
</table>

ensure the acquisition of exit competences	
Other (as the proposer wishes to add)	

Composite materials

NAME OF THE COURSE	Composite materials					
Code	KTL308	Year of study	3.			
Course teacher	Pero Dabić Matko Erceg	Credits (ECTS)	4.0			
Associate teachers	-	Type of instruction (number of hours)	L	S	E	F
			30		15	
Status of the course	Elective	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	- knowledge about new composite materials with improved or special properties in the moder society - knowledge about technologies for their production					
Course enrolment requirements and entry competences required for the course	None.					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student is expected to: - define and distinguish types of composite materials - describe the processes for the preparation of composite materials - correlate composition, structure, preparation and properties of composite materials - conclude on the importance of composite materials in modern society					
Course content broken down in detail by weekly class schedule (syllabus)	1st week: composites - definition, basic concepts and systematization, the historical development of composite materials, polymer composites, market, application. 2nd week : polymer matrices (thermoplastic, thermosetting) - properties, applications, advantages and disadvantages. 3rd week: polymer composites with particles and fibers (properties, characterization) 4th week: polymer composites with particles and fibers (properties of interface, adhesion, compatibility and compatibilization) 5th week: procedures for the preparation of polymer composites (manual and continuous laminating, spraying, winding, centrifugal casting, vacuum bag moulding, hot press moulding , autoclave primary shaping, compression moulding, pultrusion) 6th week: polymer nanocomposites: methods of preparation (melt intercalation, solution intercalation, in-situ polymerization, sol- gel process), properties and applications, methods of characterization 7th week: recycling of polymer composites 8th week: comments, discussion, conclusions. Continuous assessment (the first colloquium) 9th week: inorganic composite materials, types and comparison with conventional					

<table>
<tr><td></td><td colspan="6">inorganic materials, overview of technologies for their preparation and applications
10th week: advanced inorganic composite materials: micro and nanostructured material, composite materials strengthened with micro and nanofibers
11th week: overview of technologies for preparation of advanced composite materials: physical, chemical and plasma vapor deposition, types and properties of composites
12th week: overview of technologies for preparation of advanced composite materials: sol-gel processes, types and properties of composites
13th week: overview of technologies for preparation of advanced composite materials: hydrothermal processes, types and properties of composites
14th week: characterization of inorganic composites, durability and recycling
15th week: final comments, discussion, conclusions. Continuous assessment (the second colloquium)
Laboratory exercises :
Exercise 1. Preparation of biodegradable polylactide/olive stone flour composites
Exercise 2. Preparation of poly(ethylene oxide) nanocomposites
Exercise 3. Preparation of cement composites with the addition of nanofillers
Exercise 4. Preparation of inorganic polymer nanocomposites
Exercise 5. Composite materials based on thermoplastic polymers and red mud
Exercise 6. Analysis of composite materials using infrared spectroscopy, differential scanning calorimetry, thermogravimetry and EDXRF technique</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
□ seminars and workshops
□ exercises
□ on line in entirety
□ partial e-learning
□ field work</td><td colspan="3">□ independent assignments
x multimedia
x laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Attending lectures in the 80% amount, and laboratory exercises in the 100% amount of the total number of lessons.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training (analysis of experimental results)</td><td>0.2</td></tr>
<tr><td>Experimental work</td><td>0.5</td><td>Report</td><td></td><td>Preparation for laboratory exercises</td><td>0.3</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>0.7</td><td>Oral exam</td><td>0.6</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.7</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous evaluation:
The entire exam can be passed over two colloquium during the semester. Pass threshold for each colloquium is 50%. Each colloquium participates with 35% in a final grade. Laboratory exercises (50-100% success) participate with 20% in a final grade, while attending lectures in 80-100% amount is 10% of a final grade.
Final evaluation:
One passed colloquium (previous activity) is recognized as 10% of a final grade. The remaining part is taken on written and oral exam at prescribed examination terms. Written exam accounts for 30%, oral exam for 40%, while laboratory exercises account for 20% of a final grade, respectively.</td></tr>
</table>

	Students who did not take or pass colloquiums take written and oral exam at prescribed examination terms. Passing threshold is 50%. Written exam accounts for 40%, oral exam for 40%, while laboratory exercises account for 20% of a final grade, respectively. Grades definitions and percentages: sufficient (50-61%), good (62-74%), very good (75-87%), excellent (88-100%).		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	L.P. Durand, Composite materials research progress, Nova Science Publishers, Inc., New York, 2008.	1	Web pages of Faculty of Chemistry and Technology in Split, Croatia
	A.M. Brandt, Cement-based composites: materials, mechanical properties and performance, Taylor & Francis Group, New York, 2009.	1	
	W. Krenkel, Ceramic Matrix Composites, Willey-VCH Verlag GmbH & Co., Weinheim, 2008.	1	
	C.A. Harper, Handbook of Plastics, Elastomers, and Composites, Fourth Edition The McGraw-Hill Companies, Inc., New York, 2002.	1	
	T.W. Chou, Structure and properties of composites, Vol. 13 in Materials science and technology, R.W. Chan, P. Haasen & E.J. Kraemer, Eds., VCH Publishers Inc, New York, 1993.	1	
Optional literature (at the time of submission of study programme proposal)	D. Gay, Composite materials, CRC Press, Boca Raton, 2003.; K.S. Mazdiyasni, Fiber reinforced ceramic composites: materials, processing, and technology, Noyes Publications, New Jersey, 1990.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Mineral raw materials from seawater

NAME OF THE COURSE	**Mineral raw materials from seawater**					
Code	KTK316	Year of study	3.			
Course teacher	Vanja Martinac	Credits (ECTS)	4.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		10	5
Status of the course	Elective	Percentage of application of e-learning				
COURSE DESCRIPTION						

Course objectives	Through the program of lectures and exercises, the students master the knowledge of basic properties of seawater and methods of exploiting mineral raw materials from seawater.	
Course enrolment requirements and entry competences required for the course		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam, students are expected to: - explain and discern physical and chemical properties of seaware - discern macro and micro constituents in seawater - carry out the analysis of seawater for the content of calcium and magnesium independently according to work instructions - carry out the analysis of seawater for the boron content independently according to work instructions - determine the CO_2 content in seawater independently according to work instructions - describe technological processes of extracting mineral raw materials (magnesium, sodium chloride, bromine and fresh water) from seawater	
Course content broken down in detail by weekly class schedule (syllabus)	1. week: Seawater – a source of mineral raw materials. 2. week: The basic properties of seawater. 3. week: Physical and chemical characteristics of the seawater. 4. week: Composition of seawater. Classification of components dissolved in seawater. 5. week: Concentration and chemical forms of elements in seawater. 6. week: Constant ratios of major components of seawater. 7. week: Minor components of seawater. 8. week: Isothermal evaporation of seawater and separation of individual salts. 9. week: The effect of climactic and other factors on the evaporation process. 10. week: Evaporation of concentrated sea bittern. 11. week: Possibilities of technological exploitation of seawater. 12. week: Extraction of common salt. 13. week: Extraction of bromine from seawater. 14. week: Recovery of magnesium and magnesium compounds from seawater. 15. week: Extraction of fresh water from the seawater – desalination processes. During exercises, seawater is chemically analysed for the content of calcium, magnesium, boron and free CO_2. Practical knowledge is obtained of technological processes of extracting mineral raw materials (magnesium oxide and sodium chloride) from seawater. List of Exercises: Exercise 1. Analysis of seawater for its content of magnesium oxide and calcium oxide, Exercise 2. Analysis of seawater for its content of CO_2, Exercise 3. Determination of boron in seawater, Exercise 4. Recovery of magnesium oxide from seawater (seawater pretreatment, precipitation with 80% of the stoichiometric quantity of dolomite lime, washing and filtration, calcinations of magnesium hydroxide, chemical analysis of magnesium oxide from seawater), Exercise 5. The visit to industrial plant – salt works - extraction of common salt from seawater.	
Format of instruction	**x** lectures □ seminars and workshops **x** exercises □ *on line*in entirety □ partial e-learning	□ independent assignments **x** multimedia □ laboratory □ work with mentor ☐(other)

	x field work					
Student responsibilities	Attendance to lectures for 80% of the total number of hours. Full attendance to exercises and field work (100% of the total number of hours).					
Screening student work*(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1.0	Research		Practical training	
	Experimental work	1.0	Report	0.5	Field work	0.5
	Essay		Seminar essay		(Other)	
	Tests		Oral exam	1.0	(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Attendance to lectures is registered (not included in the rating). During the semester students have to perform exercises (lab and field work). Exercises participate with 30% in the rating. An oral exam is held in the examination periods. The oral exam is mandatory for all students. Ratings: 60 %-70 % - satisfactory, 71 %-80 % - good, 81 %-90 % - very good, 91 %-100 % - excellent.		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	1. F. J. Millero, Chemical Oceanography, 3th Edition, CRC Press, Boca Raton, 2005.	1	
	2. V. Martinac, Magnesium oxide from Seawater, (on line 2010-12-13), University handbook, (in Croatian), Faculty of Chemistry and Technology, Split, 2010.		on line
	3. Desalination, Trends and Technologies, Ed by M. Schorr (on line 2011-02-28), InTechOpen, 2011.		on line
	4. M. J. Kennish, Practical Handbook of Marine Science, 3rd Edition, CRC Press, Boca Raton, 2001.	1	
	5. V. Martinac, M. Labor, Seawater as sources of mineral raw materials, (on line 2011-01-18), Laboratory exercises, Internal mimeographed notes, (in Croatian), Faculty of Chemistry and Technology, Split, 2011.		on line
Optional literature (at the time of submission of study programme proposal)	1. M. E. Q. Pilson, Introduction to the Chemistry of the Sea, 2st edition, Prentice Hall, 2013. 2. K. Stowe, Exploring Ocean Science, Wiley, New York, 1996.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Technology and treatment of aluminium

NAME OF THE COURSE	**Technology and treatment of aluminium**

Code	KTL 310	Year of study	3.			
Course teacher	Pero Dabić	Credits (ECTS)	4.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		12	3
Status of the course	Elective	Percentage of application of e-learning				

COURSE DESCRIPTION

Course objectives	- Knowledge of the technology of alumina and aluminium production - Acquiring knowledge about aluminum processing, finalizing products and recycling of aluminum material	
Course enrolment requirements and entry competences required for the course	None.	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam the student is expected to know: - Define and differentiate basic types of raw materials - bauxite - Basics of technological process of preparing raw materials and obtaining alumina - Basics of technological process of preparing an anode and electrolysis of alumina - Types of aluminum alloys and processing procedures - Ways of recycling aluminum	
Course content broken down in detail by weekly class schedule (syllabus)	1st week: Introduction, basic properties, the importance of aluminum in the world, the amount and use of industry and everyday life 2nd week: Bauxite, species, characterization of bauxite deposits, production and prices 3rd week: Technology processing of certain types of bauxite 4th week: Bayer process of alumina obtaining 5th week: The process of obtaining graphite anodes and test raw materials, raw and baked anodes 6th week: An electrolytic cell, the basic components and structures rectifying plant for electricity supply 7th week: The process of alumina electrolysis 8th week: Assessment (first colloquium); 9th week: Refining and casting of aluminum logs and blocks 10th week: Aluminum alloy, types and properties, basic application 11th week: Processing of aluminium alloy forging 12th week: Processing of aluminium alloy casting 13th week: Recycling aluminum 14th week: Final comments, discussion, conclusions. Assessment (second colloquium). Laboratory exercises: Exercise 1 Analysis of bauxite and alumina by EDXRF method Exercise 2 Direct chemical coloring of aluminum Exercise 3 Anodizing of aluminum Exercise 4 Aluminum anodizing and coloring using eosin	
Format of instruction	x lectures ☐ seminars and workshops ☐ exercises ☐ *on line*in entirety ☐ partial e-learning	☐ independent assignments x multimedia x laboratory ☐ work with mentor ☐(other)

<table>
<tr><td></td><td colspan="6">x field work</td><td></td></tr>
<tr><td>Studentresponsibilities</td><td colspan="7">Attending lectures in the amount of 80 %, and laboratory exercises in the amount of 100 % of the total number of lessons.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.0</td><td>Report</td><td></td><td>Preparation for the preliminary lab. exercises</td><td>0.1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>0.8</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="7"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="7">Continuous evaluation:
The entire test can be applied over two exams during the semester. Passing threshold is 60 %. Each colloquium in assessing participates with 35 %. Laboratory exercises participate in the evaluation of 20 %. The presence of lectures in 80-100 % amount is 10 % of the grade.
Final evaluation:
Students who have passed the preliminary one, it is recognized as part of the exam and a 35 % score. The remaining part is laid in the regular examination period. Students who have not passed any preliminary examination, written examination in the regular examination period laid the whole subject matter. Passing threshold is 60 %, and a written examination form to participate in the evaluation by 80 %. Laboratory work involved in assessing the proportion of 20 %.
Rating: sufficient (60-70 %), good (71-80 %), very good (81-90 %), excellent (91-100 %).</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td colspan="4">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="4">G. E. Totten, D. S. MacKenzie, Handbook of Aluminum: Alloy production and materials manufacturing, Marcel Dekker Inc., New York, 2003.</td><td>1</td><td rowspan="4">KTF website</td></tr>
<tr><td colspan="4">P. G. Sheasby, R. Pinner, The Surface Treatment & Finishing of Aluminium & its Alloys, 6th Edition, ASM International, Novelty, 2004.</td><td>1</td></tr>
<tr><td colspan="4">Ch. Schmitz, Handbook of Aluminium Recycling, Vulkan-Verlag GmbH, Essen, 2006.</td><td>1</td></tr>
<tr><td colspan="4">P. Dabić_Predlošci za predavanja, KTF</td><td>1</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="7">K. Grjotheim, Tehnologija proizvodnje aluminija, teorija i primjena, (prijevod), Aluminium-Verlag GmbH, Düsseldorf, 1980.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="7">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
<tr><td>Other (as the</td><td colspan="7"></td></tr>
</table>

proposer wishes to add)	

Water protection

NAME OF THE COURSE	Water protection					
Code	KTL311	Year of study	3.			
Course teacher	Nediljka Vukojević Medvidović	Credits (ECTS)	4.0			
Associate teachers	-	Type of instruction (number of hours)	L	S	E	F
			30		13	2
Status of the course	Elective	Percentage of application of e-learning	-			

COURSE DESCRIPTION	
Course objectives	Students will become familiar with the types, distribution and quality of water in nature, the properties of aquatic ecosystems, and the methods and legislaton to preserve their quality.
Course enrolment requirements and entry competences required for the course	-
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	It is expected that the outcome of learning to provide knowledge about: - understanding the concepts ecosystem, biotope, biocenose, food chain - cycling of matter and energy in the ecosystem - abiotic and biotic ecological factors - importance of water and its physico-chemical properties - characteristics of fresh water and seawaters - physical, chemical and biological indicators of water quality - water resource management - sustainable use of water - water protection through preservation of good water condition, preventing the devastation of waters that are under risk, and remediation of degraded water status in order to preserve human health and the environment - point and nonpoint sources of pollution - protection from the harmful effects of water - classification of fresh waters and coastal sea - reuse of treated wastewater - guidelines for water reuse - legislation for wastewater and treated water - final disposal of sludge generated in the wastewater treatment plant.
Course content broken down in detail by weekly class schedule (syllabus)	1st week: Ecosystem. Biotope. Ecological factors. 2nd week: Fresh waters. Seawater. 3rd week: Physicochemical properties of water. 4th week: Indicator of water quality. 5th week: Disorders in aquatic ecosystems quality. Eutrophication. (I written evaluation) 6th week: Autopurification of water systems

	7th week: Water management. Water legislation. 8th week: Classification of fresh waters and coastal seas. The state plan for water protection. 9th week: Planning and environment management. 10th week: Conservation and improvement of water quality. (II written evaluation) 11th week: Monitoring of natural waters quality. 12th week: Legislation for effluent disposal. 13th week: Wastewaters treatment. 14th week: Field trip - visiting the technological facilities for the drinking water treatment and wastewater treatment. 15th week: Waste management and conservation of aquatic environment. (III written evaluation) Exercises 1-Characterization of water samples (color, taste, odor, turbidity, pH, and el. conductivity). Exercises 2-Determination of total solids (TS), total suspended solids (TSS) and total dissolved solids (TDS) in the water sample. Exercises 3-Adsorption of dissolved organic matter and removal of odor and color on activated carbon by batch process. Exercises 4-Determination of organic compounds by oxidizing method with $KMnO_4$.
Format of instruction	**x** lectures □ seminars and workshops **x** exercises □ *on line* in entirety □ partial e-learning x field work □ independent assignments **x** multimedia **x** laboratory □ work with mentor ☐(other)
Student responsibilities	Attending lectures is 80%, while seminars, laboratory exercises and field work 100% of the total hours.

Screening student work*(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	1.5	Research		Practical training	
	Experimental work	1.0	Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	0.5	Oral exam	0.5	(Other)	
	Written exam	0.5	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Every laboratory exercises include oral exam before exercise and writing of final report. The entire exam can be applied over the three written evaluation during the semester. Passing threshold is 60%. Students who have not passed written evaluation during the semester should attend at the final exam in the regular examination period. Final exam will include written and oral exam. Passing threshold is also 60%. Rating: 60%-70% - satisfactory, 70%-80% - good, 80%-90% very good, 90%-100% - excellent.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	S. Tedeschi, Zaštita voda, HDGI, Zagreb, 1997.	1	-
	Strategija upravljanja vodama, Hrvatske vode, AKD Zagreb, 2009.	1	-
	D. Mayer, Kvaliteta i zaštita podzemnih voda, HDZVM, Zagreb, 1993.	1	-
	B. Tušar, Ispuštanje i procišcavanja otpadne vode,	1	-

	Croatia knjiga, Zagreb, 2004.		
	D. Dikić et al., Ekološki leksikon, Ministarstvo zaštite okoliša i prostornog uređenja RH, O.P. Springer (ur.), Zagreb, 2001.	1	-
	Laboratorijske vježbe iz Zaštite voda (interna skripta).	-	web
Optional literature (at the time of submission of study programme proposal)	H.D. Sharma and S.P. Lewis, Waste Containment System, Waste Stabilization, and Landfills, John Wiley & Sons Inc., New York, 1994; D. Mayer, Voda od nastanka do upotrebe, Prosvjeta, Zagreb, 2004.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Industrial waste

NAME OF THE COURSE	**Industrial waste**					
Code	KTL312	Year of study	3.			
Course teacher	Pero Dabić	Credits (ECTS)	4.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		12	3
Status of the course	Elective	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	- The acquisition of knowledge about the sources, types and quantities of industrial waste material - The possibilities of permanent and environmentally safe disposal of industrial waste - Recycling and getting new products.					
Course enrolment requirements and entry competences required for the course	None.					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After passing the exam, the student is expected to know: - Substances that make industrial waste - Definitions and law prescribed limits - Sources, types and amounts of industrial waste materials - Recycling and getting of new products - Permanent and environmentally safe disposal					
Course content broken down in detail by weekly	1st week: Introduction, the impact on the environment , legislation on industrial waste 2nd week: Sources and types of industrial waste					

<table>
<tr><td>class schedule (syllabus)</td><td colspan="6">3rd week: Mining and rites of raw materials and the production of harmful substances
4th week: Technological processes which produce harmful waste products – metallurgical and hydrometallurgical processes
5th week: The production of inorganic binders and building materials and industrial waste
6th week: Scrap metal working industries and recovery procedures
7th week: Construction waste and options for disposal or recovery
8th week: Assessment (first colloquium);
9th week: Technological processes using industrial waste as raw material
10th week: Technological processes of solidification and stabilization of industrial waste material
11th week: Physico - chemical characterization methods of waste
12th week: Hydration and optimization of additives in cement matrix
13th week: Methods of testing new building products with addition of industrial waste - use value
14th week: Methods of testing new products with industrial waste - ecological acceptability - leaching tests
15th week: Final comments, discussion , conclusions. Assessment (2nd colloquium).
Laboratory exercises :
Exercise 1 Determination of heavy metals in the waste motor oil.
Exercise 2 Solidification and stabilization of mud from the galvanizing plant .
Exercise 3 Recovery of building materials - concrete, brick and glass .
Exercise 4 Analysis of cement kiln dust and usability.
Exercise 5 Recovery of saturated zeolite .
Exercise 6 Leaching tests of soil and ashes from the furnace</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
□ seminars and workshops
□ exercises
□ on linein entirety
□ partial e-learning
x field work</td><td colspan="3">□ independent assignments
x multimedia
x laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6">Attending lectures in the amount of 80 %, and laboratory exercises in the amount of 100 % of the total number of lessons.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.0</td><td>Report</td><td></td><td>Preparation for the preliminary lab. exercises</td><td>0.1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>0.8</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous evaluation:
The entire test can be applied over two exams during the semester. Passing threshold is 60 %. Each colloquium in assessing participates with 35 %. Laboratory exercises participate in the evaluation of 20 %. The presence of lectures in 80-100 % amount is 10 % of the grade.
Final evaluation:
Students who have passed the preliminary one, it is recognized as part of the exam</td></tr>
</table>

	and a 35 % score. The remaining part is laid in the regular examination period. Students who have not passed any preliminary examination, written examination in the regular examination period laid the whole subject matter. Passing threshold is 60 %, and a written examination form to participate in the evaluation by 80 %. Laboratory work involved in assessing the proportion of 20 %. Rating: sufficient (60-70 %), good (71-80 %), very good (81-90 %), excellent (91-100 %).		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	K-Y. Show, X. Guo, Industrial Waste, InTech, Rijeka, 2012.	1	
	L. K. Wang, Y.-T. Hung, H.H. Lo, C. Yapijakis, Handbook of Industrial and Hazardous Wastes Treatment, Marcel Dekker Inc., New York, 2004.	1	
	N. L. Nemerow, Industrial Waste Treatment, Elsevier Science & Technology Books, London, 2006.	1	
Optional literature (at the time of submission of study programme proposal)	- R. Siddique, Waste Materials and By-Products in Concrete, Springer, Berlin, 2008. - G.R. Woolley, J.J.J. Goumans, P.J. Wainwright, Waste .Materials in Construction, Pergamon Press, Amsterdam, 2000.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Environmental engineering

NAME OF THE COURSE	**ENVIRONMENTAL ENGINEERING**					
Code	KTL313	Year of study	3.			
Course teacher	Renato Stipišić	Credits (ECTS)	4.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		10	5
Status of the course	Elective	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	Acquiring the knowledge required for understanding chemical engineering problems related to unit operations that are applied to protect environment.					
Course enrolment requirements and entry competences required for the course	Undergraduate courses: Unit Ooerations.					
Learning outcomes expected at the	After passing the exam the student is expected to know: - Basic mechanisms of mass and energy transfer					

<table>
<tr><td>level of the course (4 to 10 learning outcomes)</td><td colspan="6">- Conservation of momentum, energy, mass
- Flow past immersed bodies.
- Separation methods.
- Equipment for sedimentation, flotation, dedusting
- Fundamental principles end equipment for adsorption
- Membrane processes</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">First week: Introduction and overview of the course content. Unit operations in environmental engineering.
Second week: Separation methods. Separator efficiency.
3rd week: Flow past immersed bodies.
4th week: Sedimentation
5th week: Sedimentation equipment.
6th week: Centrifugal sedimentation.
7th week: Centrifuges.
8th week: Hydrocyclones.
Examination I
9th week: Flotation.
10th week: Dedusting. Cyclones.
11th week: Scrubbers.
12th week: Adsorption.
13th week: Adsorption equipment..
14th week: Membrane processes.
15th week: Membrane processes.
Examination II
Exercises:
1. Granulometric analysis.
2. Sedimentation test.
3. Sedimentation – surface determination.
4. Centrifuges – particle size determination.</td></tr>
<tr><td>Format of instruction</td><td colspan="3">X lectures
seminars and workshops
X exercises
on linein entirety
partial e-learning
X field work</td><td colspan="3">independent assignments
X multimedia
laboratory
work with mentor
(other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6">Attendance at lectures in the amount of 80% of the hourly rate.
Attendance of the exercises in the amount of 100% of the hourly rate.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.5</td><td>Research</td><td></td><td>Practical training</td><td>1.0</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td>0.5</td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>1.0</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">The entire test can be applied over two written exams during the semester. Passing threshold is 60%. Each exam involved in the assessment with 50%. The examination periods shall be taken oral exam. Passing threshold is 60%. Rating: 60 - 69% - sufficient (2), 70 - 79% - good (3), 80-89% very good (4), 90 - 100% - excellent (5).</td></tr>
<tr><td>Required literature</td><td colspan="4">Title</td><td>Number of</td><td>Availability via</td></tr>
</table>

(available in the library and via other media)		**copies in the library**	**other media**
	W.L. McCabe, J.C. Smith, P. Harriott, Unit Operations of Chemical Engineering, McGraw-Hill, 6thedition, New York, 2001.	1	
	M. Hraste, Mehaničko procesno inženjerstvo, HINUS, Zagreb, 2003.	10	
Optional literature (at the time of submission of study programme proposal)	1. S. Tedeschi, Zaštita voda, Sveučilište u Zagrebu, Zagreb, 1997. 2. V. Koharić, Mehaničke operacije, Sveučilište u Zagrebu, Zagreb, 1996. 3. H.S. Peavy, D.R. Rowe, G. Tchobanoglous, Environmental Engineering, McGraw-Hill Book Co., New York, 1985. 4. R. Stipišić, Operacije odvajanja u zaštiti okoliša, Skripta za internu upotrebu, KTF-Split, Split, 2011.		
Quality assurance methods that ensure the acquisition of exit competences	- monitoring of students suggestions and reactions during semester - students evaluation organized by University		
Other (as the proposer wishes to add)			

Introduction to entrepreneurship

NAME OF THE COURSE	**Introduction to entrepreneurship**					
Code	KTL 314	Year of study	3.			
Course teacher	Krneta Mira	Credits (ECTS)	4.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30	15		
Status of the course	Elective	Percentage of application of e-learning				
COURSE DESCRIPTION						
Course objectives	*Introduction to Entrepreneurship* provides (1) an overview of the definition of terms entrepreneurship, entrepreneurial activity and entrepreneur, impact of the entrepreneurship on the development and importance of entrepreneurial culture and infrastructure; (2) understanding and acquisition of practical knowledge and skills which is important for a business idea generation and evaluation in regard to market, technical and financial sustainability.					
Course enrolment requirements and entry competences required for the course	MS Office tools (Word, Excel, PowerPoint).					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Graduates will be able to: - Distinguish the entrepreneurship from other forms of the economic activity and entrepreneurs from small business owners. - Define main elements of the business model for generating business ideas. - Implement, individually and/or as a team work, process of definition, analysis and					

	evaluation of the business idea sustainability. - Distinguish the advantages and disadvantages of the different forms of entrepreneurial activity. - Distinguish the different source of financing, including evaluation of the costs related to each source. - Describe specific aspects of the business idea sustainability, in the form of written document.
Course content broken down in detail by weekly class schedule (syllabus)	1st week: Introduction: objectives, scope and content of the course; teaching and assessment methods (team work). 2nd week: Entrepreneurship, entrepreneur, entrepreneurial process: conceptual definition of the entrepreneurship and entrepreneurs; differences between entrepreneurs, managers and owners of independent businesses; models measuring the frequency and intensity of the entrepreneurial activity; stages of the entrepreneurial process, the importance of entrepreneurial activity and impact on employment growth, competitiveness, targeted groups. Entrepreneurial propensity of participants (questionnaire: self-assessment entrepreneurial skills, entrepreneurial aptitude, expectations of participants, the skills related to MS office). 3rd week: Entrepreneurial idea, opportunity, intent and project: defining of the idea, opportunity, intent and project concept, business ideas sources, models for evaluation business ideas sustainability, the business idea and business plan differences. In teamwork, carrying out processes of business ideas, generating, ranking and defining the business ideas list. 4th week: Business model: explain of the term, main elements and benefits of defining of the business model, using of the business model's examples, discuss with participants about the elements of a business model based on the identified business ideas. Using a business model's template for define the elements of the business model for each of the entrepreneurial ideas. 5th week: Industry analysis: explanation of the importance of the industry analysis for entrepreneurial planning, explanation of the scope, content and methods of the industry analysis; explanation of the main elements of competition analysis, using examples. In teamwork, for each business project, determination of the corresponding industry, identification of the major trends of the industry and sources of the statistical data. 6th week: Market analysis: explanation of the market analysis importance, scope and content, possible approaches and methods; explanation of what is the market segmentation and the method of determining the target market explanation of the selling prices methods. Conducting market analysis, for each business project. 7th week: Marketing plan: explanation of the marketing strategy content and scope, the sales process activities and way of defining the promotional mix; explanation of the distribution channels content and scope. Creating a marketing plan for each business project. 8th week: Technical aspect of the entrepreneurial project: explanation of the terms, scope, content and technical aspects of the entrepreneurial planning, the importance of the definition of the project's micro and macro location, including the environmental protection and cost. Determining the technical aspect of the entrepreneurial project: various forms of assets (fixed and current assets), the location of the project. 9th week: Technological aspect of the entrepreneurial project: explanation of the terms, scope, content of the technological aspects of entrepreneurial planning explanation of the elements of the production and business processes, business functions, and elements of the organizational structure. Identifying the way of

<table>
<tr><td></td><td colspan="6">realization of production and business processes, organizational structure, management structure, business support functions.
10th week: Assessment of investment value and source of the funding: explanation of the importance of valuation, structure and dynamics of the entrepreneurial project's investments; explain possible sources of funding, the cost aspect of individual funding sources and method of estimating the costs of financing investment. For each entrepreneurial project: identifying the investment specific items and funding sources.
11th week: Economic aspect of the entrepreneurial project: explanation of the scope and content of the entrepreneurial project economic aspects, the elements of the entrepreneurial project economic viability. For individual projects: drawing up a table of the income and expenditure values.
12th week: Financial aspect of the entrepreneurial project: explanation of the scope and content of the entrepreneurial project financial aspects, the elements of the project's financial viability. For individual projects: estimation of the cost of financing and the indicators of the project's success.
13th week: Risk analysis: explanation of the concept of risk analysis and risk management, explanation of the importance of identifying potential risks and the likelihood of their occurrence; explanation of methods of risk management. For individual projects: identifying potential risks, assessing the likelihood of each risk and determining a way to avoid and reduce risks.
14th week: Sensitivity analysis: explanation of the content and scope of the entrepreneurial project sensitivity analysis, explanation of the sensitivity analysis method. At the project level, identifying the critical factors affecting the entrepreneurial project, determining the relative impact factors, conducting the sensitivity analysis of the project on the impact of each factor.
15th week: - Revision, assessment (test).</td></tr>
<tr><td>Format of instruction</td><td colspan="3">x lectures
□ seminars and workshops
□ exercises
□ on line in entirety
□ partial e-learning
□ field work</td><td colspan="3">x independent assignments
□ multimedia
□ laboratory
□ work with mentor
☐(other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Class participation and attendance – min. 80%.
Individual (team) work – project.</td></tr>
<tr><td rowspan="6">Screening student work(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>1.0</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>1.0</td><td>Project</td><td>1.0</td><td>(Other)</td><td></td></tr>
<tr><td></td><td colspan="5"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Students' assessment is performed in the regular examination periods, by passing the written and oral examinations. The written part of the exam is 40% of the total points and the oral 50%. 10% of the total points are determined on the basis of lecture attendance, participation in discussions and group work (project).
It is possible to pass the exam during the semester through: (1) passing the test (theoretical aspect of entrepreneurship), with more than 50% out of the total points, (2) successful development of the individual part of project within the group work and (3) regular attendance at lectures and participation in discussions.</td></tr>
</table>

<table>
<tr><td></td><td colspan="3">Rating scale: (1) 55-65% - satisfactory, (2) 66-76% - good, (3) 77-89% - very good, (4) 90-100% - excellent.</td></tr>
<tr><td rowspan="9">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Morris, Michael; 2012.; Practical Guide to Entrepreneurship – How to turn an idea into a profitable business; KoganPage, London.</td><td></td><td>1</td></tr>
<tr><td>Spinelli, Stephen, Jr; 2012.; New Venture Creation – Entrepreneurship for the 21th Century; 9th Edition; McGraw-Hill International Edition.</td><td></td><td>1</td></tr>
<tr><td>Kuratko, Donald, F.; 2009.; Entrepreneurship Theory, Process and Practice; South-Western College Pub; 8th edition.</td><td></td><td>1</td></tr>
<tr><td>Buble, Marin; Kružić, Dejan; 2006.; Poduzetništvo – realnost sadašnjosti i izazovi budućnosti; RRIF, Zagreb.</td><td></td><td>1</td></tr>
<tr><td>Marsh, Clive; 2013.; Businee and Financial Models; KoganPage, London.</td><td></td><td>1</td></tr>
<tr><td>Written materials prepared for lectures and team work (project)</td><td></td><td>1</td></tr>
<tr><td>Morris, Michael; 2012.; Practical Guide to Entrepreneurship – How to turn an idea into a profitable business; KoganPage, London.</td><td></td><td>1</td></tr>
<tr><td>Spinelli, Stephen, Jr; 2012.; New Venture Creation – Entrepreneurship for the 21th Century; 9th Edition; McGraw-Hill International Edition.</td><td></td><td>1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">Barrow C.P.; Barrow R.; 2005.; Brown The Business Plan Workbook: The Definitive Guide to Researching, Writing up and Presenting a Winning Plan; 6th edition; Kogan Page; London and Philadelphia.
Bendeković, J. i sur.; 2007.; Priprema i ocjena investicijskih projekata; FOIP 1974 d.o.o., Zagreb.
European Commision; 2003.; Green Paper – Entrepreneurship in Europe; www.studentstarter.eu.
Good Finance Guide for Small Businesses: How to raise, manage and grow your company's cash; A & C Black; London.
Leburić, A.; Krneta, M.; 2003.; Profil poduzetnika; Naklada Bošković, Split.
Nugus, N.; 2006.; Financial Planning using Excel: Forecasting, planning and budgeting techniques; second edition; Elsevier & Cima Publishing.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- monitoring of students suggestions and reactions during semester
- students evaluation organized by University</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3">-</td></tr>
</table>

3. STUDY PERFORMANCE CONDITIONS

3.1. Places of the study performance

Buildings of the constituent part (name existing, under construction and planned buildings)	
Identification of building	
Location of building	
Year of completion	
Total square area in m^2	
Identification of building	
Location of building	
Year of completion	
Total square area in m^2	

3.2. List of teachers and associate teachers

Course	Teachers and associate teachers
General and inorganic chemistry	PhD, Marijo Buzuk, Assistant professor
Chemical calculus	PhD, Marijo Buzuk, Assistant professor
Mathematics	PhD, Branka Gotovac, Lecturer
Physics	PhD, Mirko Marušić, Higher lecturer
Computers application	PhD, Dražan Jozić, Associate professor
Analytical chemistry	PhD, Josipa Giljanović, Associate professor
Fundamentals of organic chemistry	PhD, Ani Radonić, Associate professor
Fundamentals of physical chemistry	PhD, Renato Tomaš, Assistant professor
Safety at work	PhD, Pero Dabić, Associate professor
Fundaments of mechanical structures	PhD, Lovre Krstulović-Opara, Full professor
Thermodynamics and thermotechnics	PhD, Vanja Martinac, Full professor
Unit operations	PhD, Renato Stipišić, Lecturer
Electrochemical engineering	PhD, Senka Gudić, Full professor
Chemical reactors	PhD, Sandra Svilović, Assistant professor
Metal construction materials	PhD, Ladislav Vrsalović, Associate professor
Measuring and control technique	PhD, Renato Stipišić, Lecturer
Polymerization processes	PhD, Matko Erceg, Associate professor
Materials in the construction engineering	PhD, Dražan Jozić, Associate professor
Corrosion and metals protection	PhD, Maja Kliškić, Full professor
Technology of the pretreatment of raw water	PhD, Dražan Jozić, Associate professor
Methods for identification of materials	PhD, Dražan Jozić, Associate professor

	PhD, Sanja Perinović Jozić, Assistant professor
Polymeric materials	PhD, Branka Andričić, Full professor
Industrial wastewaters	PhD, Nediljka Vukojević Medvidović, Associate professor
Coatings	PhD, Nataša Stipanelov Vrandečić, Associate professor
Durability of non-metallic materials	PhD, Jelica Zelić, Full professor
Solid waste and recycling	PhD, Ladislav Vrsalović, Associate professor
Processing and recycling of polymers	PhD, Matko Erceg, Associate professor
Composite materials	PhD, Pero Dabić, Associate professor PhD, Matko Erceg, Associate professor
Mineral raw materials from seawater	PhD, Vanja Martinac, Full professor
Technology and treatment of aluminium	PhD, Pero Dabić, Associate professor
Water protection	PhD, Nediljka Vukojević Medvidović, Associate professor
Industrial waste	PhD, Pero Dabić, Associate professor
Environmental engineering	PhD, Renato Stipišić, Lecturer
Introduction to entrepreneurship	PhD, Mira Krneta, Assistant professor

3.3. Curriculum vitae of the course teacher

First and last name and title of teacher	**PhD, Branka Andričić, Full professor**
The course he/she teaches in the proposed study programme	Polymeric materials
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 469
E-mail address	branka@ktf-split.hr
Personal web page	
Year of birth	1965.
Scientist ID	188492
Research or art rank, and date of last rank appointment	Senior Research Scientist - November 14th, 2008
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full professor, - December 24th, 2010
Area and field of election into research or art rank	Technical Sciences, Chemical Engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology, University of Split
Date of employment	February 19th, 1991
Name of position (professor, researcher, associate teacher, etc.)	Full Professor

Field of research	Chemical Engineering in Materials Development
Function	Vice dean
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of Chemistry and Technology, University of Split
Place	Split
Date	December 19th, 2001
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	Italian (2)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Polymeric Materials – undergraduated study of Chemical Technology; professional study of Chemical Technology 2. Naturally Occurring Polymers – graduated study of Chemical Technology (Materials) 3. Combined Polymeric Materials - graduated study of Chemical Technology (Materials)
Authorship of university/faculty textbooks in the field of the course	B. Andričić, Prirodni polimerni materijali, University Handbook, Split, 2010.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. S. Perinović, B. Andričić, M. Erceg, Thermal Properties of Poly(L-lactide)/Olive Stone Flour Composites, Thermochimica Acta 510 (2010) 97-102 2. Lj. Kratofil Krehula, Z. Hrnjak-Murgić, J. Jelenčić, B. Andričić, Evaluation of Poly(ethylene-terephthalate) Products of Chemical Recycling by Differential Scanning Calorimetry, Journal of Polymers and the Environment. 17 (2009) 20-27. 3. S. Perinović, B. Andričić, Influence of different processing techniques on the thermal properties of poly(L-lactide)olive stone flour composites, 15th European Conference on Composite Materials, Venice, 24-28 June 2012 4. S. Perinović, B. Andričić, M. Čagalj, Migration and leaching of plasticizer from plasticized poly(L-lactide)/olive stone flour composites, 14th European Conference on Composite Materials, Budimpešta, 7-10. 6. 2010.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5	Scientific project 011-1252971-2249: Polymer Blends with Biodegradable Components (2007-2013)

at most)	
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	Evaluation organizer: University of Split Polymeric Materials: Av. Grade: > 4 Naturally Occurring Polymers: Av. Grade: > 4.5 Combined Polymeric Materials, Av. Grade: 5

First and last name and title of teacher	**PhD, Marijo Buzuk, Assistant professor**
The course he/she teaches in the proposed study programme	General and inorganic chemsitry Chemical calculus
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21 000 Split
Telephone number	++385 21 329 474
E-mail address	buzuk@ktf-split.hr
Personal web page	-
Year of birth	1978.
Scientist ID	267150
Research or art rank, and date of last rank appointment	Research Associate; 17. july 2012.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	assistant professor, 28. november 2012.
Area and field of election into research or art rank	Natural science; Chemistry
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemsitry and Technology, University of Split, Croatia
Date of employment	1. september 2004.
Name of position (professor, researcher, associate teacher, etc.)	assistant professor
Field of research	Analytical and Bioanalytical Chemistry, Electrochemistry, Environmental Chemistry
Function	Head of Department of General and Inogranic Chemistry
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of Chemical Engineering and Chemistry
Place	Zagreb, Croatia
Date	3. september 2010.
INFORMATION ON ADDITIONAL TRAINING	
Year	2008.-2009.
Place	Graz, Austria
Institution	Institute for Analytical Chemsitry
Field of training	Analytical and Bioanalytical Chemistry

MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Courses: 1. General chemistry 2. General chemistry with stoichiometry 3. General and Inorganic chemistry 4. Inorganic Chemistry 5. Water Chemistry 6. Environmental Menagment system
Authorship of university/faculty textbooks in the field of the course	-
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. S. Brinić, M. Bralić, M. Buzuk, M. Bralić, M. Buljac, D. Jozić, Cu (II) Ion-Selective Electrode Based on Mixed Silver-Copper Sulfide: Phase Structure and Electrochemical Properties, International Journal of Electrochemical Science, 7 (6) (2012) 5217. 2. S. Brinic, M. Buzuk, M. Bralić, E. Generalić, Solid-contact Cu(II) ion-selective electrode based on 1,2-di-(o-salicyladiminophenylthio)ethane, Journal of Solid State Electrochemistry, 16 (4) (2012), 1333. 3. S. Brinic, M. Buzuk, E. Generalić and M. Bralić, Improving the Response of Copper(II) Selective PVC Membrane Electrode by Modification of N2S2 Donor Ligand, Acta Chimica Slovenica, 57 (2010) 318. 4. K. Kalcher, I. Svancara, M. Buzuk, K. Vytras, A.Walcarius, Electrochemical sensors and biosensors based on heterogeneous carbon materials, Monatshefte für Chemie, 140 (2009) 861.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken	

in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Pero Dabić, Associate professor**
The course he/she teaches in the proposed study programme	Safety at work Composite materials Technology and treatment of aluminium Industrial waste
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 470
E-mail address	dabic@ktf-split.hr
Personal web page	http://tkojetko.irb.hr/znanstvenikDetalji.php?sifznan=5319
Year of birth	1962.
Scientist ID	181084
Research or art rank, and date of last rank appointment	Scientific Advisor, 26.09.2013.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associate Professor, 24.11.2009.
Area and field of election into research or art rank	Chemical engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology in Split
Date of employment	19.03.1990.
Name of position (professor, researcher, associate teacher, etc.)	Associate Professor
Field of research	Inorganic Technology
Function	Professor
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Ph.D.
Institution	Faculty of Chemistry and Technology
Place	Split
Date	04.04.2004.
INFORMATION ON ADDITIONAL TRAINING	
Year	1991.
Place	Rapperswil, Swiss
Institution	Perkin-Elmer Laboratory
Field of training	Thermal analysis
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	German (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (3)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	

COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Safety at work, Industrial waste 1. Toxicology and protection of the restoration, Art Academy in Split, University study (2000.-2004.) 2. Safety at work, Professional study of Chemical Technology (2005.-); undergraduated study of Chemical Technology; (2005.-); undergraduated study of Chemistry (2005.-); Integrated undergraduate and graduate of Pharmacy(2011.-) Composite materials, Technology and treatment of aluminium 1. New inorganic materials, graduated study of Chemical Technology: Materials (2005.-) 2. Technological processes in inorganic industry, undergraduated study of Chemical Technology; (2005.-) 3. Technology and treatment of aluminium**,** Professional study of Chemical Technology (2005.-)
Authorship of university/faculty textbooks in the field of the course	P. Dabić, Sigurnost pri radu, KTF, 2010. P. Dabić, Novi anorganski materijali, KTF-Split, 2013.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	Safety at work, Composite materials, Industrial waste 1. Barbir, Damir; Dabić, Pero; Krolo, Petar. Hydration Study of Ordinary Portland Cement in the Presence of Lead(II) Oxide. // *Chemical and biochemical engineering quarterly*. 27 (2013), 1; 95-99. 2. Barbir, Damir; Dabić, Pero; Krolo, Petar. Stabilization of chromium salt in ordinary portland cement. // *Sadhana*. 37 (2012), 6; 731-737. 3. Bralić, Marija; Buljac, Maša; Periš, Nenad; Buzuk, Marijo; Dabić, Pero; Brinić, Slobodan. Monthly and seasonal variations of NO2, SO2 and black-smoke located within the sport district in urban area, City of Split, Croatia. // *Croatica chemica acta*. 85 (2012), 2; 139-145. 4. Barbir, Damir; Dabić, Pero; Krolo, Petar.Hydration study of ordinary Portland cement in the presence of lead(II) oxide // *Conference Proceedings: 3rd International Symposium on Environmental Management: Toward Sustainable Technologies* / Koprivanac, Natalija; Kušić, Hrvoje; Lončarić Božić, Ana (ur.). Zagreb: Faculty of Chemical Enginnering and Technology, University of Zagreb, 2011. 348-352. 5. Dabić, Pero; Krolo, Petar; Bubić, Ana; Krstulović, Ruža. Solidification and stabilization of waste zeolite in cement matrix//*16.Internationale Baustofftagung, Tagungsbericht, Band I, II* / Fischer H.-B. (ur.). Weimar: F.A. Finger-Institute fur Baustoffkunde, Bauhaus-Universitat Weimar, 2006. 483. Technology and treatment of aluminium 1. Barbir, Damir; Dabić, Pero; Krolo, Petar. Hydration Study of Ordinary Portland Cement in the Presence of Lead(II) Oxide.//*Chemical and biochemical engineering quarterly*.. 27 (2013) 1; 95-99. 2. Barbir, Damir; Dabić, Pero; Krolo, Petar. Stabilization of chromium salt in ordinary portland cement, *Sadhana*. 37 (2012), 6; 731-737. 3. Bralić, Marija; Buljac, Maša; Periš, Nenad; Buzuk, Marijo; Dabić, Pero; Brinić, Slobodan. Monthly and seasonal variations of NO_2, SO_2 and black-smoke located within the sport district in urban area, City of Split, Croatia.//

	Croatica chemica acta. 85 (2012), 2; 139-145. 4. Despić, J. Radošević, P. Dabić, M. Kliškić, Abnormal yields of hydrogen and the mechanism of its evolution during cathodic polarization of aluminium, *Electrochimica Acta*. 35 (1990), 11-12; 1743-1746. 5. J. Radošević, M. Kliškić, P. Dabić, R. Stevanović, A. Despić, Processes on aluminium on the negative side of the open-circuit potential, *Journal of Electroanalytical Chemistry,* 277 (1990), 1-2; 105-119.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	P. Dabić, Novi anorganski materijali, KTF-Split, 2013.
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	1. Cement composites and stabilization of hazardous waste (MZOS, 2007. -2014.). 2. Portland cement hydration and hazardous wastes (MZOS, 2002. - 2006.)
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	Years of professor experience in graduate courses and undergraduate professional studies.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Matko Erceg, Associate professor**
The course he/she teaches in the proposed study programme	Polymerization processes Processing and recycling of polymers Composite materials (part of course)
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 459
E-mail address	merceg@ktf-split.hr
Personal web page	-
Year of birth	1976.
Scientist ID	243566
Research or art rank, and date of last rank appointment	Senior researcher, 26.09.2013.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associate professor, 17.07.2012.
Area and field of election into research or art rank	Area: Technical Sciences; Field: Chemical Engineering
INFORMATION ON CURRENT EMPLOYMENT	

Institution where employed	Faculty of Chemistry and Technology, Teslina 10/V, 21000 Split
Date of employment	01.02.2001.
Name of position (professor, researcher, associate teacher, etc.)	Associate professor
Field of research	Polymer engineering
Function	Head of Department of Organic Technology
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Ph.D.
Institution	Faculty of Chemistry and Technology
Place	Split
Date	17.05.2007.
INFORMATION ON ADDITIONAL TRAINING	
Year	2007.
Place	Lyon, Francuska
Institution	Institut de Recherches sur le Catalyse et l'Environnement de Lyon
Field of training	Thermal analysis methods in chemical engineering
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English; 5 (excellent)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	German; 2 (sufficient)
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Polymerization processes: 1. Polymer processing procedures, graduate study of Chemical technology 2. Chemistry of polymers, undergraduate study of Chemical technology Processing and recycling of plastics: 1. Polymer processing procedures, graduate study of Chemical technology 2. Recycling of plastics, graduate study of Chemical technology Composite Materials: 1. Polymer nanocomposites, C:\Users\Branka\AppData\Local\upisi\kemija.pdfUniversity postgraduate study: Chemical engineering in materials development and environmental protection
Authorship of university/faculty textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. M. Erceg, D. Jozić, Preparation and characterization of poly (3-hydroxybutyrate)/Cloisite25A nanocomposites,e-polymers 025 (2013) 1-12. 2. M. Erceg, T. Kovačić, S. Perinović, Isothermal degradation of poly(3-hydroxybutyrate)/organically modified montmorillonite nanocomposites, Polymer Composites 31 (2010) 272-278. 3. S. Perinović, B. Andričić, M. Erceg, Thermal Properties of Poly(L-lactide)/Olive Stone Flour Composites, Thermochimica acta 510 (2010) 97-102. 4. M. Erceg, Ž. Šalov, L. Minić, Utjecaj ekstrudiranja na toplinske karakteristike i kinetiku toplinske razgradnje polietilena visoke gustoće, MATRIB 2011., Vela Luka, 29.6.-1.7.2011, Conference Proceedings, 90-102.

	5. M. Erceg, L. Kurte, M. Kursan, Utjecaj recikliranja na toplinska svojstva i kinetiku toplinske razgradnje polipropilena, Polimeri: časopis za plastiku i gumu 32 (2011) 74-80.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	Scientific project 'Polymer blends with biodegradable components' (011-1252971-2249) financed by the Ministry of Science, Education and Sports of Republic of Croatia
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	Evaluation organizer: University of Split Average grade: a) Polymer Processing Procedures: 5.0 b) Recycling of Plastics: 5.0 c) Chemistry of Polymers: 4.9

Izv. prof. dr. sc. Josipa Giljanović

Mr. sc. Branka Gotovac, predavač

First and last name and title of teacher	**PhD, Senka Gudić, Full professor**
The course he/she teaches in the proposed study programme	Electrochemical engineering
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 433
E-mail address	senka@ktf-split.hr
Personal web page	
Year of birth	1965.
Scientist ID	181062
Research or art rank, and date of last rank appointment	Senior Research Scientist - May 12th, 2009.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full Professor - July 25, 2011.
Area and field of election into research or art rank	Technical Sciences, Chemical Engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology, University of Split
Date of employment	November 2nd, 1990.

Name of position (professor, researcher, associate teacher, etc.)	Full Professor
Field of research	Analysis, synthesis and management of chemical processes
Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of Chemistry and Technology, University of Split
Place	Split
Date	June 21st, 2000.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Electrochemical engineering, Direct energy conversion – professional study of Chemical technology (Chemical Technology and Materials) 2. Electrochemistry, Chemica sources of energy – undergraduated study of Chemical technology 3. Electrochemical methods and their application, Direct energy conversion - graduated study of Chemical technology (Materials).
Authorship of university/faculty textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. L. Vrsalović, S. Gudić, M. Kliškić, *Salvia Officinalis* L. honey as corrosion inhibitor for CuNiFe alloy in sodium chloride solution, Indian J. Chem. Technol. 19 (2012), 96-102. 2. M. Gojić, L. Vrsalović, S. Kožuh, A.C. Kneissl, I. Anžel, S. Gudić, B. Kosec, M. Kliškić, Electrochemical and microstructural study of Cu-Al-Ni shape memory alloy, J. Alloy. Compd. 506 (2011) 9782-9790. 3. L. Vrsalović, E.E. Oguzie, M. Kliškić, S. Gudić, Corrosion inhibition of CuNi10Fe alloy with phenolic acids, Chem. Eng. Comm. 198 (2011) 1380-1393. 4. S. Gudić, I. Smoljko, M. Kliškić, The effect of small addition of tin and indium on the corrosion behaviour of aluminium in chloride solution, J. Alloy. Compd. 505 (2010) 54-63. 5. S. Gudić, I. Smoljko, M. Kliškić, Electrochemical behaviour of aluminium alloys containing indium and tin in NaCl solution, Mater. Chem. Phys. 121 (2010) 561-566.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at	

most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Dražan Jozić, Associate professor**
The course he/she teaches in the proposed study programme	Materials in the construction cngineering Methods for characterization of materials Technology of the pretreatment of raw water Computer application
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 442
E-mail address	jozicd@ktf-split.hr
Personal web page	http://kefa.ktf-split.hr/home/nastava/172-djelatnici/cv/155-drazanjozic.html
Year of birth	1974.
Scientist ID	231234
Research or art rank, and date of last rank appointment	Senior research scientist, 26.12.2013.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	PhD, Associated professor, 29.05.2013.
Area and field of election into research or art rank	Area: Technical Sciences, Field: Chemical Engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology
Date of employment	01.07.2003.
Name of position (professor, researcher, associate teacher, etc.)	Associated professor
Field of research	Chemical Engineering in the developing a materials
Function	Member of the Department
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of Chemistry and Technology
Place	Split
Date	20.07.2007.
INFORMATION ON ADDITIONAL TRAINING	

Year	2004.
Place	Monza, Italy
Institution	Perkin Elmer
Field of training	Training for maintaining, adjusting and properly operation of the instrument for thermogravimetric measurements with simultaneous differential thermal analysis (TG / DTA) model Perkin Elmer Pyris Diamond
Year	2010.-2011.
Place	Trieste, Italy
Institution	Elettra-Sincrotrone Trieste S.C.p.A.
Field of training	Application Synchrotron radiation in the different instrumental techniques and experimental methods of recording at Austrian SAXS beamline such as of Small Angles X-ray Scattering at (SAXS), Grazing-Incidence Small-Angle X-ray Scattering (GISAXS) and Wide-Angle X-ray Scattering (WAXS, XRD). in the purpose of developing materials in engineering materials especially nanostructured materials.
Year	2011.
Place	Planneralm, Austria
Institution	Institut für Physik, Montanauniversität Leoben, Austria
Field of training	Application Synchrotron and Neutron radiation in the purpose of Characterization different type of materials
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English, 4
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Minerals binders, Process in the inorganic industry, professional study of Chemical technology (Chemical Technology and Materials) 2. Computer application, undergraduated study of Chemistry 3. Computer application, undergraduated study of Chemical technology
Authorship of university/faculty textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	<u>Materials in the construction engineering</u> 1. D. Jozić, S. Zorica, D. Tibljaš, S. Bernstorff, Insitu SAXS/WAXS study of the developing process of geopolymer structures, 15th European Conference on Composite Materials, Venice, Italy, 2012, pp.1-8., USB disk 2. M.N. Mužek, J. Zelić, D. Jozić, Microstructural Characteristics of Geopolymers Based on Alkali-Activated Fly Ash, Chemical and biochemical engeenering quartely. 26 (2012.), 2; 89-95. 3. D. Jozić, M. Martinović, S. Bernstorff, Kinetics of cement hydration of type CEM I 42.5R without and with replacement addition of fly ash, Slovenian-Italian Conference on Materials and Technologies for Sustainable Growth, Proceedings book, M.Valant, S. Gardonio, E. Fabbretti and U. Pirnat (Eds.), University of Nova Gorica, Slovenia, 2011, pp.19-24.

	4. D. Jozić, I. Knezovića, S. Bernstorff, Kinetics of cement hydration with replacement addition of fly ash into aqueous suspension systems, International conference on materials, tribology, recycling, Proceedings, Z. Schauperl, S. Šolić (Eds.), Croatian Society for Materials and Tribology, Vela Luka, 2011, pp.159-167. 5. D. Jozić; J. Zelić; I. Janjatović, Influence of the coarse fly ash (Class F) on the mechanical properties of the cement mortars, Ceramics-Silikáty, 54 (2010), 2; 144-151. <u>Methods for characterization of materials</u> 1. M. Erceg, D. Jozić, Preparation and characterization of poly(3-hydroxybutyrate)/Cloisite25A nanocomposites, e-Polymers 025 (2013), 1-12. 2. S. Brinić, M. Buzuk, M. Bralić, M. Buljac, D. Jozić, Cu (II) Ion-Selective Electrode Based on Mixed Silver-Copper Sulfide: Phase Structure and Electrochemical Properties, International journal of Electrochemical Science. 7 (2012), 5217-523. 3. M. Lučić Lavčević, S. Bernstorff, P. Dubček, D. Jozić, I. Jerković, Z.Marijanović, GISAXS/GIXRD View of ZnO Films with Hierarchical Structural Elements, Journal of Nanotechnology, (2012) 1-10. 4. D. Jozić, S. Zorica, D. Tibljaš, S. Bernstorff, Insitu SAXS/WAXS study of the developing process of geopolymer structures, 15th European Conference on Composite Materials, Venice, Italy, 2012, pp.1-8. 5. D. Jozić; J. Zelić; I. Janjatović, Influence of the coarse fly ash (Class F) on the mechanical properties of the cement mortars, Ceramics-Silikáty, 54 (2010), 2; 144-151.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	1. Collaborator in the Beamtime Project Nr. 20090434, Analysis of nanostructures in metal oxide thin films by simultaneous application of the GISAXS and GIXRD techniques, 16/03/2009 , Project leader: PhD Magdy Lučić Lavčević, (20.12.2009-24.12.2009.) 2. Scientific project in the framework of CERES Research Felowship: The study of processes and products of geopolymerisation by using SAXS/WAXS, Project leader: PhD Dražan Jozić, (from 01.10.2010.to 01.10.2011.) 3. Beamtime Project Nr. 20115315, In-situ characterization of the developing microstructure in geopolymers under different experimental preparation conditions by simultaneous SAXS/WAXS/IR measurements, Project leader: PhD Dražan Jozić, (24.05-06.06.2012.)
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	CEI Research Fellowship Programme (CERES) (Marie Currie/FP7)
Results of student evaluation taken	

in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Maja Kliškić, Full professor**
The course he/she teaches in the proposed study programme	Corrosion and metals protection
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 435
E-mail address	mkliskic@ktf-split.hr
Personal web page	
Year of birth	1953.
Scientist ID	119820
Research or art rank, and date of last rank appointment	Senior Research Scientist - April 21st, 2006.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full Professor - permanent position - July 25, 2011.
Area and field of election into research or art rank	Technical Sciences, Chemical Engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology, University of Split
Date of employment	December 1st, 1982.
Name of position (professor, researcher, associate teacher, etc.)	Full Professor - permanent position
Field of research	Analysis, synthesis and management of chemical processes
Function	Head of Department of Electrochemistry and Materials Protection
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of Chemistry and Technology, University of Split
Place	Split
Date	October 28th, 1994.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	

Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Construction materials - undergraduated study of Chemical Technology 2. Corrosion and materials protection - graduated study of Chemical Technology (Environmental protection, Mediterranean Cultures), professional study of Chemical Technology (Chemical technology and materials, Food technology) 3. Corrosion engineering - postgraduate doctoral study Chemical engineering in eaterials eevelopment and environmental protection 4. Corrosion and materials protection - postgraduate scientific study of Mechanical engineering, Faculty of electrical engineering, mechanical engineering and naval architecture in Split
Authorship of university/faculty textbooks in the field of the course	M. Kliškić, L. Vrsalović, Vježbe iz tehnologije površinske zaštite, recenzirana skripta, Kemijsko-tehnološki fakultet, Split, 2005.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. B. Lalić, M. Kliškić, I. Komar, Analiza korozijskog djelovanja u cilindru brodskoga sporohodnoga dvotaktnog dizelskog motora, Znanstveno-stručni časopis za more i pomorstvo "Naše more". 60 (2013), (1/2); 8-15. 2. I. Smoljko, S. Gudić, N. Kuzmanić, Kliškić, Maja, Electrochemical properties of aluminium anodes for Al/air batteries with aqueous sodium chloride electrolyte. Journal of applied electrochemistry. 42 (2012), 11; 969-977. 3. L. Vrsalović, E. E. Oguzie, M. Kliškić, S. Gudić, Corrosion inhibition of CuNi10Fe alloy with phenolic acids, Chemical engineering communications. 198 (2011), 11; 1380-1393. 4. L. Vrsalović, M. Kliškić, S. Gudić, I. Smoljko, Corrosion inhibition of Al-Mg alloy by gentisic acid. Indian journal of chemical technology. 17 (2010.), 2; 89-94. 5. L. Vrsalović, M. Kliškić, S. Gudić, Application of Phenolic Acids in the Corrosion Protection of Al-0.8Mg Alloy in Chloride Solution International journal of electrochemical science, 4 (2009), 11; 1568-1582.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on	

grading scale and course evaluated)	
First and last name and title of teacher	**PhD, Mira Krneta, Assistant professor**
The course he/she teaches in the proposed study programme	Introduction to entrepreneurship
GENERAL INFORMATION ON COURSE TEACHER	
Address	Split, Vukovarska 113
Telephone number	++385 21 475 462; 098 239 987
E-mail address	mkrneta@hbor.hr
Personal web page	-
Year of birth	1958.
Scientist ID	92366
Research or art rank, and date of last rank appointment	-
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Assistant Professor; 8.12.2009.
Area and field of election into research or art rank	Economics; Management
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Croatian Bank for Reconstruction and Development
Date of employment	1.4.2004.
Name of position (professor, researcher, associate teacher, etc.)	-
Field of research	-
Function	Head of Regional Office for Dalmatia
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of Economics and Business
Place	University of Zagreb, Zagreb
Date	1/2/2005
INFORMATION ON ADDITIONAL TRAINING	
Year	2006.
Place	Zagreb
Institution	Appraisers Association of Croatia
Field of training	Business valuation
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English; good.
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	Italian; good.
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	Russian; good.
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Since academic year 2010/2011, as an external associate, have been teaching Hotel Industry Investment, in the graduate study. 2. Since academic year 2010/1011, as an external associate, have been teaching practical part of Student Business Academy course. 3. In academic year 2011/2012, as an external associate,

	taught Entrepreneurial Planning in the University Department of Professional Studies, University of Split. 4. From academic year 2007/2008 to 2009/2010, as an external associate, taught Business Planning and Entrepreneurial Planning in the undergraduate study. 5. From 2004 to 2006 included in the education process of start-up entrepreneurs at the Faculty of Economics, University of Split, and entrepreneurs centres in Zadar, Šibenik, Knin, and Split.
Authorship of university/faculty textbooks in the field of the course	-
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. Krneta, M.; Pivčević, S. The effects of chosen governmental financial policy measures aimed at Croatian islands' economic sustainability enhancement with special stress on tourism; Island Sustainability II; ed. S.Favro, C.A.Brebbia; WITpress, 2013.; 12, 51-62. 2. Alfirević, N.; Gonan Božac, M.; Krneta, M. Determinants of innovative start-up development in Croatia, The Future of Economics: Between Rules and Discretion, Gonan Božac, M.; Ribnikar, I. (ur.) Pula: Sveučilište u Puli, 2013; 229-250. 3. Krneta, M. Poduzetnički identitet jadranske regije, Identitet jadranskog prostora Hrvatske: retrospekt i prospekt, Crnjak-Karanović, B.; Derado, D.; Fredotović, M.: Petrić, L. (ur.). Split: Sveučilište u Splitu, Ekonomski fakultet, 2012; 103-119. 4. Krneta, M.; Šalinović, T. Poduzetnička aktivnost žena u Hrvatskoj: učestalost i glavna obilježja poduzetnica i poslovanja; u: Mala i srednja poduzeća: Financijska politika i ekonomsko-financijski okvir podrške; Ekonomski fakultet Split, 2012.; 95-111. 5. Hell, M.; Krneta, M.; Krneta, P.; Application of AHP Method for the Selection of Business Plan Software; 14th International Conference on Operational Research KOI 2012.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	-
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	1. Ministry of Science, Education and Sports – research project: Identity of Croatian Adriatic Area and European Integration Processes. 2. Ministry of Science, Education and Sports – research project: Small and Medium Enterprises: Financial Policy and Support.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	-
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	-
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	Evaluation organizer: University of Split Business Planning; Entrepreneurial Planning, Hotel Industry Investment: very good. Student Business Academy: excellent.

First and last name and title of teacher	**PhD, Lovre Krstulović-Opara, Full professor**
The course he/she teaches in the proposed study programme	Fundaments of mechanical structures
GENERAL INFORMATION ON COURSE TEACHER	
Address	FESB, R. Boškovića 32
Telephone number	++385 21 305 981
E-mail address	Lovre.Krstulovic-Opara@fesb.hr
Personal web page	www.fesb.hr/~opara
Year of birth	1967.
Scientist ID	203806
Research or art rank, and date of last rank appointment	
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full professor, 10.10.2010.
Area and field of election into research or art rank	Technical sciences, field of mechanical design and naval architecture, branch mechanical engineering - structures
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculy of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split
Date of employment	1.9.2001.
Name of position (professor, researcher, associate teacher, etc.)	Full Professor
Field of research	metal structures design, thermography (ITC Level 2), non-destructive testing (UT2, PT1), experimental mechanics
Function	Full Professor
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	University Hannover
Place	Hannover
Date	13.12.2000.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English - excellent
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	Italian - excellent
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	German - good
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Fundaments of mechanical structures KTF, 2. Fundaments of mechanical structures (FESB), 3. Mechanical structures (University of Dubrovnik), 4. Metal structures design (FESB)

Authorship of university/faculty textbooks in the field of the course	Ž. Domazet, L. Krstulović-Opara, “Skripta iz Osnova strojarstva”, KTF, Split, 2006.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. Krstulović-Opara, Lovre; Domazet, Željko; Garafulić, Endri. Detection of osmotic damages in GRP boat hulls. // Infrared physics & technology. 60 (2013.); 359-364. 2. Vesenjak, Matej; Krstulović-Opara, Lovre; Ren, Zoran. Characterization of irregular open-cell cellular structure with silicone pore filler. // Polymer testing. 32 (2013), 8; 1538-1544. 3. Vesenjak, Matej; Krstulović-Opara, Lovre; Ren, Zoran. Characterization of photopolymer cellular structure with silicone pore filler. // Polymer testing. 31 (2012.), 5; 705-709. 4. Krstulović-Opara, Lovre; Klarin, Branko; Neves, Pedro; Domazet, Željko. Thermal imaging and Thermal Stress Analysis of the impact damage of composite materials. // Engineering failure analysis. 18 (2011); 713-719. 5. Vesenjak, Matej; Krstulović-Opara, Lovre; Ren, Zoran; Domazet, Željko. Cell shape effect evaluation of polyamide cellular structures. // Polymer testing. 29 (2010), 8; 991-994 (članak, znanstveni). URL link to workURL link to work.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	1. Ministry of Science, Education and Sports project (project principal): Fatigue strength of constructions and materials 2. Croatian-Sebian bilateral program of collaboration (project principal): Application of thermography to energy performance evaluation 3. DAAD project (project principal): Dynamic multi-scale analysis of irregular open cell cellular structures 4. Croatian-Slovenian bilateral program of collaboration (project principal): Modelling and development and of materials with open-cell structures 5. DAAD project (project principal): Multiscale numerical and experimental modelling of inhomogeneous materials based on the rapid structure prototyping
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	Master degree program on FSB Zagreb
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	2013.-KTF, Osnove strojarstva KTE108-a, av.=4,6 2013.-KTF, Osnove strojarstva KTE108-b, av.=4,1 2012.-KTF, Osnove strojarstva KTE108-a, av.=4,7 2012.-KTF, Osnove strojarstva KTE108-c, av.=4,3 2011.-KTF, Osnove strojarstva KTE108-a, av.=4,4 2011.-KTF, Osnove strojarstva KTE108-c, av.=3,8 2010.-FESB, Osnove mehaničkih konstrukcija FESI01, av.=4,3 2090.- no evaluation performed by University of Split

First and last name and title of teacher	**PhD, Vanja Martinac, Full professor**

The course he/she teaches in the proposed study programme	Thermodynamics and thermotechnics Mineral raw materials from seawater
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10 / V, 21000 Split
Telephone number	++385 21 329 420
E-mail address	martinac@ktf-split.hr
Personal web page	http://tkojetko.irb.hr/znanstvenikDetalji.php?sifznan=3492&podaci=dokumenti
Year of birth	1959.
Scientist ID	119805
Research or art rank, and date of last rank appointment	Senior Research Scientist – 21st April 2006.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full professor (with tenure) – 25th July 2011.
Area and field of election into research or art rank	Area – Technical Sciences, Field – Chemical Engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology
Date of employment	04th June 1984.
Name of position (professor, researcher, associate teacher, etc.)	Full professor (with tenure) in Department of Thermodynamics
Field of research	Research and Highly Education
Function	Head of Department of Thermodynamics (1998.-)
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Ph. D. of Technical Sciences in the Field of Chemical Engineering
Institution	Faculty of Technology University of Split
Place	Split
Date	08th July 1994.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	Englsh (3)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Technical thermodynamics (base level) on: Undergraduated University Study Programm in Chemical Technology from 1996. to 2005., Professional Study of Chemical Technology (Study Orientation: Chemical Technology and Food Technology) 2001. and 2002. 2. Thermodynamics (base level) on: Undergraduated University Study Programm in Chemical

	Technology, Study Orientation: Chemistry and Technology of Mediterranean plants from 2002. to 2005., Academic Undergraduate Study of Chemical Technology, Study Orientation: Chemical Engineering and Enviromental Protection from 2005. 3. Thermodynamics and thermotechnics (base level) on: Professional Study of Chemical Technology (Study Orientation: Process Technology and Food Technology) from 2002. to 2005., Professional Study of Chemical Technology (Study Orientation: Chemical Technology and Materials, and Food Technology) from 2005. Professional Study of Food Technology on Polytechnic of Knin "Marko Marulić" from 2005. to 2012. 4. Thermodynamics of real processes (base level) on: Undergraduated University Study Programm in Chemical Technology, Study Orientation: Chemical Technology Processes from 1998. to 2006. Academic Graduate Study of Chemical Technology, Study Orientation: Materials and Enviromental Protection from 2008. 5. Chemical engineering thermodynamics (advanced level) on: Postgraduated Study in "Chemical Engineering in Materials Development ", acad. year 2004./05. Postgraduated Doctoral Study in "Chemical Engineering in Materials Development and Enviromental Protection", acad. year 2008./09. i 2012./13. 6. Marine and submarine raw materials (base level) on: Undergraduated University Study Programm in Chemical Technology, Study Orientation: Technology of Sea and Mediterranean plants from 1993. to 2002., Undergraduated University Study Programm in Chemical Technology, Study Orientation: Chemistry and Technology of Mediterranean plants from 2002. to 2005., Academic Graduate Study of Chemical Technology, Study Orientation: Materials from 2008. god. 7. Marine and submarine raw materials (advanced level) on Postgraduated Study in "Engineering Chemistry" acad. year 1994./95. and 2000./01. 8. Activated Sintering of Magnesium Oxide (advanced level) on Postgraduated Study in "Chemical Engineering in Materials Development", acad. year 2004./05. 9. Magnesium Oxide from Seawater (advanced level) on: Postgraduated Study in "Chemical Engineering in Materials Development", acad. year 2004./05. Postgraduated Doctoral Study in "Chemical Engineering in Materials Development and Enviromental Protection", acad. year 2008./09. and 2012./13. 10. Marine Raw Materials in Chemical Industry and Medicine (advanced level) Postgraduate Study in "Applied Marine Science" (collaboration with University Centre for Marine Studies University of Split and Department of Aquaculture University of Dubrovnik), acad. year 2006./07. 11. Seawater as Sources of Mineral Raw Materials (base level) Academic Undergraduate Study of Chemical Technology, Study Orientation: Chemical Engineering from 2005.
Authorship of university/faculty textbooks in the field of the course	1. N. Petric, I. Vojnović, V. Martinac, Technical Thermodynamics, University book, (in Croatian), 1st Ed., Hinus, Zagreb 1999.

	2. N. Petric, I. Vojnović, V. Martinac, Technical Thermodynamics, University book, (in Croatian), 2nd Ed., Faculty of Chemistry and Technology, on line (2007-01-09), Split, 2007. 3. V. Martinac, Thermodynamics and Thermotechnics, (Handbook-Formulas and Tables), (in Croatian), Faculty of Chemistry and Technology, on line (2008-12-09), Split, 2008. 4. N. Petric, V. Martinac, Chemical Engineering Thermodynamics, (Thermodynamics of Real Processes), Internal faculty textbook, (in Croatian), Faculty of Technology, Split, 1998. 5. V. Martinac, Chemical Engineering Thermodynamics, Internal faculty textbook, (in Croatian), Faculty of Chemistry and Technology, Split, 2008. 6. V. Martinac, J. Jakić, Thermodynamics (Laboratory Exercises), on line (2011-11-15), Internal mimeographed notes, (in Croatian), Faculty of Chemistry and Technology, Split, 2010. 7. V. Martinac, Magnesium Oxide from Seawater, (on line 2010-12-13), University handbook, (in Croatian), Faculty of Chemistry and Technology, Split, 2010. 8. V. Martinac, M. Labor, Seawater as Sources of Mineral Raw Materials, (on line 2011-01-18), Laboratory exercises, Internal mimeographed notes, (in Croatian), Faculty of Chemistry and Technology, Split, 2011.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. M. Labor, V. Martinac, N. Petric, B_2O_3 Content in the Sintered Magnesium Oxide Obtained from Seawater, Ind. J Chem. Technol., 20 (2013) 276-281. 2. M. Labor, M. Tolo, V. Martinac, J. Jakić, The MgO (80% precipitation) from Seawater, Proceedings of the International Conference on Materials, Processes, Friction and Wear, MATRIB 2013, Ž. Alar, S. Jakovljević, S. Šolić (Eds.), Zagreb, Croatian Society for Materials and Tribology, 2013.,248-254. 3. V. Martinac, Effect of TiO_2 Addition on the Sintering Process of Magnesium Oxide from Seawater, Sintering of Ceramics - New Emerging Techiques, A. Lakshmanan (Ed.), Rijeka, InTech, 2012., 309-322. 4. V. Martinac, T. Maleš, M. Labor, Activated Sintering of Magnesium Oxide from Seawater with TiO_2 Addition, Metallic and Nonmetalic Materials: Production, Properties, Application, Proceedings of the 8th Scientific-Research Symposium with International Participation Metallic and Nonmetallic Materials, S. Muhamedagić (Ed.), Zenica, University of Zenica, Faculty of Metallurgy and Materials Science, 2010., 231-236. 5. V. Martinac, J. Jakić, M. Miroslav, Effect of TiO_2 on Sintering of Magnesium Oxide Obtained from Seawater, Proceedings of the 11st International Conference on Materials, Processes, Friction and Wear, K. Grilec, G. Marić (Eds.), Zagreb, Croatian Society for Materials and Tribology, 2009., 129-135.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	Scientific Project 011-0112247-2250 “Acitivated Sintering of Magnesium Oxide“, Ministry of Science, Education and Sports of the Republic of Croatia, (2002.-2013.); Principal Investigator: Prof. Ph.D. V. Martinac

The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	Evaluation organizer: University of Split Thermodynamics: Av. Grade: > 3.0 Thermodynamics and Thermotechnics: Av. Grade: > 3.5 Thermodynamics of Real Processes: Av. Grade: > 4.7 Seawater as Sources of Mineral Raw Materials: Av. Grade: 5.0

First and last name and title of the lecturer	**PhD, Mirko Marušić, Higher lecturer**
The course he/she teaches in the proposed study programme	Physics
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 450
E-mail address	mmarusic@ktf-split.hr
Personal web page	
Year of birth	1971.
Scientist ID	337170
Research or art rank, and date of last rank appointment	
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	senior lecturer, December 12th 2013
Area and field of election into research or art rank	natural sciences, physics
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology, University of Split
Date of employment	January, 9th 2014
Name of position (professor, researcher, associate teacher, etc.)	senior lecturer
Field of research	physics
Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Ph.D. in the science of methodology of teaching physics
Institution	Faculty of Natural Sciences and Mathematics
Place	Sarajevo
Date	March 5th 2013
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	*Music acoustics*, undergraduate programme of Music art of Composition, Art academy, University of Split
Authorship of university/faculty textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five	1. M. Marušić, J. Sliško. Influence of Three Different Methods of Teaching Physics on the Gain in Students' Development

years in the field of the course (5 works at most)	of Reasoning. // *International Journal of Science Education*. 34 (2012), 2; 301-326. 2. M. Marušić, J. Sliško. Effects of two different types of physics learning on the results of CLASS test. // *Physical Review Special Topics. Physics Education Research*. 8 (2012). 3. M. Marušić, J. Sliško. Increasing the attractiveness of school physics: the effects of two different designs of physics learning. // *Revista Mexicana de Física E*. 58 (2012), 1; 75-83. 4. N. Erceg, M. Marušić, J. Sliško. Students' strategies for solving partially specified physics problems. // *Revista Mexicana de Fisica E*. 57 (2011), 1; 44-50. 5. M. Marušić, N. Erceg, J. Sliško. Partially specified physics problems: university students' attitudes and performance. // *European journal of physics*. 32 (2011), 3; 711-722.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	1. M. Marušić, J. Sliško. Influence of Three Different Methods of Teaching Physics on the Gain in Students' Development of Reasoning. // *International Journal of Science Education*. 34 (2012), 2; 301-326. 2. M. Marušić, J. Sliško. Effects of two different types of physics learning on the results of CLASS test. // *Physical Review Special Topics. Physics Education Research*. 8 (2012). 3. N. Erceg, M. Marušić, J. Sliško. Students' strategies for solving partially specified physics problems. // *Revista Mexicana de Fisica E*. 57 (2011), 1; 44-50. 4. M. Marušić, N. Erceg, J. Sliško. Partially specified physics problems: university students' attitudes and performance. // *European journal of physics*. 32 (2011), 3; 711-722. 5. M. Marušić, J. Sliško. Physics Education Research in Croatia: Historical Roots and Actual Trends. // *European Journal of Physics Education*. 3 (2012), 2; 34-51.
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	
The name of the programme and the volume in which the lecturer passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	1. 2007 – Postgraduate study – Didactics of natural sciences – Physics; Faculty of Natural Sciences and Mathematics, University of Split 2. 1996 – Undergraduate study programme – course of study: mathematics and physics teacher, Faculty of Natural Sciences and Mathematics, University of Split
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Sanja Perinović Jozić, Assistant professor**
The course he/she teaches in the proposed study programme	Methods for characterization of materials
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split

Telephone number	++385 21 329 455
E-mail address	sanja@ktf-split.hr
Personal web page	
Year of birth	26.09.1978.
Scientist ID	267214
Research or art rank, and date of last rank appointment	Research associate, 12.06.2012.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Assistant professor, 18.01.2013.
Area and field of election into research or art rank	Scientific sector of technical sciences, field of chemical engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of chemistry and technology
Date of employment	01.09.2005.
Name of position (professor, researcher, associate teacher, etc.)	Assistant professor
Field of research	Chemical engineering in materials development
Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of chemistry and technology
Place	Split
Date	11.01.2012.
INFORMATION ON ADDITIONAL TRAINING	
Year	2006.
Place	Aachen, Germany
Institution	Deutsches Wollforschungsinstitut an der Reinisch-Westfalisch Technische Hochschule (DWI an der RWTH)
Field of training	Polymeric materials
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English, 4
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	
Authorship of university/faculty textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. M. Erceg, T. Kovačić, S. Perinović, Isothermal degradation of poly(3-hydroxybutyrate)/organically modified montmorillonite nanocomposites, Polym. Compos. 31 (2010) 272-278. 2. S. Perinović, B. Andričić, M. Erceg, Thermal Properties of Poly(L-lactide)/Olive Stone Flour Composites, Thermochim. Acta, 510 (2010) 97-102.

	3. B. Andričić, T. Kovačić, S. Perinović, I. Klarić, Polymer Blends Based on Poly(vinyl chloride) and Biodegradable Aliphatic-Aromatic Copolyester, J. Appl. Polym. Sci. 109 (2008) 1002-1008. 4. M. Erceg, T. Kovačić, S. Perinović, Kinetic analysis of the non-isothermal degradation of poly(3-hydroxybutyrate) nanocomposites, Thermochim. Acta 476 (2008) 44-50. 5. S. Perinović, B. Andričić, Influence of different processing techniques on the thermal properties of poly(L-lactide)/olive stone flour composites, 15th European Conference on Composite Materials, Venice, (2012) 1-8.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	1. Polymer blends with biodegradable components (011-1252971-2249), Ministry of science, education and sports of the Republic of Croatia, 2007.-2013. 2. Polylactide composites with olive stone flour as a filler, Carlsberg Croatia d.o.o, Ministry of science, education and sports of the Republic of Croatia and Croatian environmental agency, 2009.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	1. first place in the local competition of *FameLab* (popularisation of science), 2. *Green scholarships of Carlsberg Croatia* for a one-year project *"Polylactide composites with olive stone flour as a filler"*, 3. IUPAC scholarships for participation in *European Polymer Congress 2009* for a paper *Application of Model-Free Kinetics to the Thermal Degradation of Poly(L-lactide)/Olive Stone Flour Composites*.
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Ani Radonić, Associate professor**
The course he/she teaches in the proposed study programme	Fundamentals of organic chemistry
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 436
E-mail address	radonic@ktf-split.hr
Personal web page	/
Year of birth	1966.
Scientist ID	3119068

Research or art rank, and date of last rank appointment	Research Scientist; March 30th, 2012.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associate Professor; May 24th, 2012.
Area and field of election into research or art rank	Natural sciences, Chemistry
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology, University of Split
Date of employment	October 1st, 1992.
Name of position (professor, researcher, associate teacher, etc.)	Associate professor
Field of research	- Essential oils-free volatile compounds: monoterpenes, sesquiterpenes, phenylpropanoids; isolation methods; fractionation methods of complex volatile isolates; analysis of volatile isolates by gas chromatography-mass spectrometry (GC-MS) - Glycosidically bound volatile compounds - water-soluble, non-volatile aroma precursors: methods of isolation, purification and hydrolysis (enzymatic, acid); identification of aglycones by GC-MS - Evaluation of antioxidant activity of free volatile compounds (essential oils) using different methods: radical scavenging method (DPPH method), β-carotene bleaching method, thiobarbituric acid method (TBA method) and method for determination of oxidative stability (Rancimat method) - Glucosinolates (thioglucosides) and their degradation products from wild-growing *Brassicaceae* plants: methods of isolation and degradation (thermal degradation, enzymatic degradation); analysis of liberated volatile degradation products by GC-MS; research of volatile degradation products biological activity: testing of antioxidant activity by radical scavenging method (DPPH method); evaluation of antimicrobial activity by the disc-diffusion method and microdilution method (MIC method) in cooperation with Department of Biology, Faculty of Natural Science, University of Split
Function	Head of Department of Organic Chemistry
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of Chemistry and Technology, University of Split
Place	Split
Date	September 14th, 2005.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	

Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Undergraduate study of chemistry: Organic chemisry I, Organic chemistry II, Natural products, Perfumes and cosmetics 2. Graduate study of Chemistry: Synthesis of biologically active compounds 3. Professional study of Chemical technology: Fundamentals of organic chemistry 4. Graduate study of Pharmacy: Organic chemistry I, Organic chemistry II, Pharmacognosy
Authorship of university/faculty textbooks in the field of the course	I. Jerković, A. Radonić, Praktikum iz organske kemije, Udžbenici Sveučilišta u Splitu, Split, 2009.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. I. Blažević, A. Radonić, M. Skočibušić, G. R. De Nicola, S. Montaut, R. Iori, P. Rollin, J. Mastelić, M. Zekić A. Maravić, Glucosinolate Profiling and Antimicrobial Screening of *Aurinia leucadea (Brassicaceae)*, *Chem. Biodivers.* 8 (2011) 2310-2321. 2. A. Radonić, I. Blažević, J. Mastelić, M. Zekić, M. Skočibušić, A. Maravić, Phytochemical Analysis and Antimicrobial Activity of *Cardaria draba* L. Desv. volatiles, *Chem. Biodivers.* 8 (2011) 1170-1181. 3. I. Blažević, A. Radonić, J. Mastelić, M. Zekić, M. Skočibušić, A. Maravić, Hedge Mustard (*Sisymbrium officinale*): Chemical Diversity of Volatiles, and Their Antimicrobial Activity, *Chem. Biodivers.* 7 (2010) 2023-2034. 4. I. Blažević, A. Radonić, J. Mastelić, M. Zekić, M. Skočibušić, A. Maravić, Glucosinolates, glycosidically bound volatiles and antimicrobial activity of *Aurinia sinuata* (Brassicaceae), *Food chem*. 121 (2010) 1020-1028.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	Science project No. 011-0982929-1329: "Essential oils and flavours- biological active compounds and their modifications", Ministry of Science, Education and Sports, Republic of Croatia, 2007. - 2013.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Nataša Stipanelov Vrandečić, Associate professor**
The course he/she teaches in the proposed study programme	Coatings
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 459
E-mail address	nstip@ktf-split.hr
Personal web page	http://tkojetko.irb.hr/znanstvenikDetalji.php?sifznan=7463
Year of birth	1966.
Scientist ID	226264
Research or art rank, and date of last rank appointment	Senior Research Scientist, 2010-4-27
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associated Professor, 2013-7-16
Area and field of election into research or art rank	Area: Technical Sciences; Field: Chemical Engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistriy and Technology
Date of employment	1995-06-01
Name of position (professor, researcher, associate teacher, etc.)	Associated Professor
Field of research	Chemical Engineering in Materials Development
Function	Vice dean
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of Chemistry and Technology
Place	Split
Date	2003-3-28
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English, 4
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	French, 2
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Coatings, Professional study of Chemical technology (Chemical Technology and Materials) 2. Coatings, Graduate study of Chemical technology (Materials) 3. Processes in organic industry, Professional study of Chemical technology (Chemical Technology and Materials) 4. Polymer Characterisation, Graduate study of Chemical technology (Materials)
Authorship of university/faculty	

textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. M. Jakić, N. Stipanelov Vrandečić and I. Klarić, Thermal degradation of poly(vinyl chloride)/poly(ethylene oxide) blends: Thermogravimetric analysis, Polymer Degradation and Stability 98 (2013) 1738-1743. 2. N. Stipanelov Vrandečić, M. Erceg, M. Jakić and I. Klarić, Kinetic analysis of thermal degradation of poly(ethylene glycol) and poly(ethylene oxide)s of different molecular weight, Thermochimica Acta 498 (2010) 71-80 3. M. Jakić, N. Stipanelov Vrandečić, I. Klarić, Utjecaj poli (etilen-glikola) na toplinsku razgradnju mješavina poli(vinil-klorid)/poli(etilen-oksid) International Conference on Materials, Tribology, Recycling - MATRIB 2013, Zagreb: Hrvatsko društvo za materijale i tribologiju, Vela Luka, 2013. 192-203. 4. M. Erceg, M. Omazić, N. Stipanelov Vrandečić, I. Banovac: Preparation and characterization of poly(ethylene oxide)/lithium montmorillonite composites, 15th European Conference On Composite Materials, Venecija, Italija, 2012. 5. N. Stipanelov Vrandečić, M. Jakić, I. Klarić, S. Muslim: Dinamička termogravimetrijska razgradnja mješavina PVC/PEO, 13th Ružička Days; Osijek, Prehrambeno-tehnološki fakultet Osijek i Hrvatsko društvo kemijskih inženjera i tehnologa (HDKI), 2011., 175-185.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	Scientific project 011-1252971-2249: Polymer Blends with Biodegradable Components (2007-2013)
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	Award of the Society of Plastics and Rubber for master's thesis in the field of polymeic technology (2001-12-4).
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	Evaluation organizer: University of Split Coatings: Avarage Grade: 5.0 Processes in Organic Industry: Avarage Grade: 4.7 Polymer Characterisation: 4.8

First and last name and title of teacher	**PhD, Renato Stipišić, Lecturer**
The course he/she teaches in the proposed study programme	Unit operations Measuring end control technique Environmental engineering
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split

Telephone number	098595766
E-mail address	stipisic@ktf-split.hr
Personal web page	
Year of birth	1965
Scientist ID	
Research or art rank, and date of last rank appointment	
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Lecturer
Area and field of election into research or art rank	
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	University of Split, Faculty of Chemistry and Technology
Date of employment	01.07.1992.
Name of position (professor, researcher, associate teacher, etc.)	Lecturer
Field of research	Chemical engineering
Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	
Institution	
Place	
Date	
INFORMATION ON ADDITIONAL TRAINING	
Year	1998.
Place	Crikvenica
Institution	BVQI
Field of training	EMS Auditor Training Course (IRCA ISO 14001)
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (3)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	Slovenian (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Measuring and control technique, Professional study: Chemical technology 2. Unit operations, Professional study: Chemical technology 3. Operatinos and equipment in food industy, Professional study, Food technology
Authorship of university/faculty textbooks in the field of the course	1. R. Žanetić, R. Stipišić, Mjerni pretvornici u procesnoj industriji, Kemijsko-tehnološki fakultet, 2005. 2. R. Stipišić, Operacije odvajanja u zaštiti okoliša, Kemijsko-tehnološki fakultet, 2011.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. R. Stipišić, N. Cinoti, S. Svilović, R. Žanetić, D. Rušić,"Projektiranje kotlastog fotobioreaktora za uzgoj morske alge Nannochloropsis sp.", XII. Ružičkini dani, Vukovar 2008. 2. R. Stipišić, D. Rušić, N. Cinoti, S. Svilović, R. Žanetić,

	"Determination of light intensity in marine algae cultivation photobioreactor", 13th Ružička Days "Today science-tomorrow industry", Vukovar, Hrvatska, 16.-17. 09. 2010.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Sandra Svilović, Assistant professor**
The course he/she teaches in the proposed study programme	Chemical reactors
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 431
E-mail address	sandra@ktf-split.hr
Personal web page	
Year of birth	1974
Scientist ID	237630
Research or art rank, and date of last rank appointment	Research scientist - May 27th, 2013
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Assistant professor - July 15th, 2010
Area and field of election into research or art rank	Technical sciences, chemical engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology, University of Split
Date of employment	June 1st, 2000
Name of position (professor, researcher, associate teacher, etc.)	Assistant professor
Field of research	Reaction engineering
Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD

Institution	Faculty of Chemistry and Technology, University of Split
Place	Split
Date	July 23rd, 2009
INFORMATION ON ADDITIONAL TRAINING	
Year	2003
Place	Split
Institution	Faculty of Science, University of Split
Field of training	Software Mathematica
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Chemical reactors - professional study of chemical technology
Authorship of university/faculty textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. S. Svilović, D. Rušić, R. Žanetić, Thermodynamics and Adsorption Isotherms of Copper Ions Removal from Solutions Using Synthetic Zeolite X, Chemical and biochemical engineering quarterly, 22 (3) (2008) 299-305. 2. S. Svilović, D. Rušić, R. Stipišić, Modeling batch kinetics of copper ions sorption using synthetic zeolite NaX, Journal of Hazardous Materials, 170 (2-3) (2009) 941-947. 3. S. Svilović, D. Rušić, R. Žanetić, Utjecaj procesnih parametara na ionsku izmjenu bakra na zeolitu 13X, MATRIB 2009, Vela Luka (2009) 187-194. 4. S. Svilović, D. Rušić, A. Bašić, Investigations of different kinetic models of copper ions sorption on zeolite 13X, Desalination, 259 (2010) 71-75. 5. M.N. Mužek, S. Svilović, J. Zelić, Fly ash-based geopolymeric adsorbent for copper ion removal from wastewater, Desalination and Water Treatment, doi:10.1080/19443994.2013.792015
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	Project 011-0112247-2245 Chemical engineering in examination of mariculture
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-	

didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Renato Tomaš, Assistant professor**
The course he/she teaches in the proposed study programme	Fundamentals of physical chemistry
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 448
E-mail address	rtomas@ktf-split.hr
Personal web page	www.ktf-split.hr
Year of birth	20 June 1967
Scientist ID	226242
Research or art rank, and date of last rank appointment	Senior research associate (2 October 2013)
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Assistant professor (31 March 2011)
Area and field of election into research or art rank	Natural Sciences, Chemistry
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology (FCT), University of Split
Date of employment	1 January 2006
Name of position (professor, researcher, associate teacher, etc.)	Assistant professor
Field of research	1. *Solution chemistry (*properties of electrolytes in mixed solvents*):* thermodynamics of electrochemical reactions, thermodynamics of metal-ligand complexes formation, thermodynamics of the association reaction of electrolytes, transference number measurements of electrolytes and determination of limiting molar conductivities of ions, viscosity and density studies of electrolytes (study of ion-ion and ion-solvent interactions). 2. *Supramolecular chemistry:* thermodynamics of calixarene chemistry. 3. *Experimental methods used:* potentiometry, conductometry, viscometry and densitometry, UV-Vis spectrometry.
Function	Head of Department of Physical Chemistry, FCT, University of Split: 2007 - 2009 and 2011 -2013
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Ph.D. degree in Natural Sciences, Chemistry
Institution	Faculty of Chemistry and Technology (FCT), University of Split
Place	Split
Date	29 October 2002
INFORMATION ON ADDITIONAL TRAINING	

Year	2012 2008
Place	Ljubljana Zagreb
Institution	- Chair of Physical Chemistry, Department of Chemistry and Biochemistry, Faculty of Chemistry and Chemical Technology, University of Ljubljana, Slovenia - Division of Physical Chemistry, Department of Chemistry, Faculty of Science, University of Zagreb, Croatia
Field of training	Research training: solution chemistry and supramolecular chemistry. Teaching training: Physical Chemistry, Experimental Physical Chemistry, Chemometrics.
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (good)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Lecturer in Selected Topics in Physical Chemistry of Environmental to Ph.D. students of chemistry. 2. Lecturer in Colloid and Surface Chemistry to Ph. D. students of chemistry and biology. 3. Lecturer in Physical Chemistry to undergraduate and graduate students of chemistry, chemical technology, pharmacy, and biology and chemistry. 4. Seminar teacher to undergraduate and graduate students taking courses in Physical Chemistry. 5. Laboratory teacher in Physical chemistry to undergraduate and graduate students taking courses in Physical Chemistry. 6. Lecturer and seminar in Elements of Physical Chemistry on the professional study of chemical technology. 7. Laboratory teacher in Physical Chemistry of Electrolyte Solutions to graduate students of chemistry.
Authorship of university/faculty textbooks in the field of the course	J. Radošević, V. Sokol, R. Tomaš, P. Bošković, Laboratory Experiments in Physical Chemistry, University of Split, Split, 2012 (under review)
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. N. Galić, N. Burić, R. Tomaš, L. Frkanec, V. Tomišić, Synthesis and Cation Binding Properties of Fluorescent Calix[4]Arene Derivatives Bearing Tryptophan Units at the Lower Rim, *Supramolecular Chemistry*, 23(5) (2011), 389-397. 2. V. Sokol, R. Tomaš, P. Bošković, Ion-Association Reaction of Rb^+ and Br^- in 2-Methylpropan-2-ol + Water Mixtures, *Acta Chimica Slovenica*, 59(4) (2012) 920-926. 3. A. Bald, Z. Kinart, R. Tomaš, Volumetric studies of aqueous solutions of monosodium salts of some aliphatic dicarboxylic acids at 298.15 K. A new method of data analysis, *Journal of Molecular Liquids*, 178(2) (2013) 94-98. 4. R. Tomaš, V. Sokol, P. Bošković, A. Turudić, Transference Numbers of Sodium Chloride in Formamide + Water Mixtures at 298.15 K from Potential Difference

	Measurements, *International Journal of Electrochemical Science*, 8(6) (2013) 7669-7679. 5. 5) A. Bald, Z. Kinart, A. Wypych-Stasiewicz, R. Tomaš, Conductance studies of NaCl, KCl, NaBr, KBr, Bu_4NBr, and $NaBPh_4$ in water + 2-methoxyethanol at 298.15 K, *Journal of Molecular Liquids*, 182(6) (2013) 14-24.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	2008-2013, Ministry of Science, Republic of Croatia, research project: "Properties of electrolytes in mixed solvents".
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	Results of student evaluation are positive in the last five years.

First and last name and title of teacher	**PhD, Ladislav Vrsalović, Associate professor**
The course he/she teaches in the proposed study programme	Metal construction materials Solid waste and recycling
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 475 707
E-mail address	ladislav@ktf-split.hr
Personal web page	
Year of birth	1974.
Scientist ID	237626
Research or art rank, and date of last rank appointment	Scientific advisor, 26. 11. 2013.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associate professor, 28. 11. 2012.
Area and field of election into research or art rank	
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	University of Split, Faculty of chemistry and technology
Date of employment	01. 07. 2000.
Name of position (professor, researcher, associate teacher, etc.)	Associate professor
Field of research	analysis, synthesis and management of chemical processes

Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Ph.D.
Institution	University of Split, Faculty of chemistry and technology
Place	Split
Date	03. 04. 2008.
INFORMATION ON ADDITIONAL TRAINING	
Year	2007.
Place	Rijeka
Institution	University of Rijeka
Field of training	First Synchrotron Radiation Summer School "Syncro 07".
Year	2004.
Place	Zagreb
Institution	Center for technology transfer, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb
Field of training	Organization of laboratories according to standard HRN EN ISO/IEC 17025
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English 4
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Surface protection technology, graduate study of Chemical technology 2. Corrosion and environment, graduate study of Chemical technology 3. Solid waste and recycling, graduate study of Chemical technology (Academic year 2009./10 and 2010./11.) 4. Electrodeposition, undergraduate study of Chemical technology 5. Electrodeposition processes, professional study of Chemical technology 6. Solid waste and recycling, professional study of Chemical technology (Academic year 2009./10 and 2010./11.)
Authorship of university/faculty textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. S. Kožuh, M. Gojić, L. Vrsalović, B. Ivković, Corrosion failure and microstructure analysis of AISI 316L stainless steels for ship pipeline before and after welding, *Kovove Materialy - Metallic Materials* 51 (2013) 53-61. 2. L. Vrsalović, S. Gudić, M. Kliškić, Salvia officinalis L. honey as corrosion inhibitor for CuNiFe alloy in sodium chloride solution, *Indian journal of chemical technology* 19 (2012) 96-102. 3. M. Gojić, L. Vrsalović, S. Kožuh, D. Ćubela, S. Gudić, Microstructural analysis of Ti-Ni shape memory alloy after corrosion testing in 0.9 % NaCl solution, *Proceedings of XIV YuCorr International Conference*, Tara, Srbija, 2012., 289-297. 4. M. Gojić, L. Vrsalović, S. Kožuh, A. Kneissl, I. Anžel, S.

	Gudić, B. Kosec, M. Kliškić, Electrochemical and microstructural study of Cu-Al-Ni shape memory alloy, *Journal of alloys and compounds* 509 (2011) 9782-9790. 5. L. Vrsalović, E. Oguzie, M. Kliškić, S. Gudić, Corrosion inhibition of CuNi10Fe alloy with phenolic acids, *Chemical engineering communications* 198 (2011) 1380-1393.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	Project 011-1252973-2243: „Electrochemical proceses on phase boundary and phisical properties of surfaces - ELGRAFA III".
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	**PhD, Nediljka Vukojević Medvidović, Associate professor**
The course he/she teaches in the proposed study programme	Industrial wastewater Water protection
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 329 454
E-mail address	nvukojev@ktf-split.hr
Personal web page	http://tkojetko.irb.hr/znanstvenikDetalji.php?sifznan=19202
Year of birth	1976
Scientist ID	243570
Research or art rank, and date of last rank appointment	Scientific advisor, 26 November, 2013
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associate professor, 26 November, 2012
Area and field of election into research or art rank	Area of Technical Science, field of chemical engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology
Date of employment	01 March, 2001
Name of position (professor, researcher, associate teacher, etc.)	Associate professor
Field of research	Scientific, educational and professional activities related to

	wastewater treatment and environmental remediation
Function	Head of Department of Environmental Engineering
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Doctor of Science, (PhD of technical sciences, chemical engineering)
Institution	Faculty of Chemistry and Technology
Place	Split
Date	25 May, 2007
INFORMATION ON ADDITIONAL TRAINING	
Year	2006
Place	Sofia, Bulgaria
Institution	Institute of Organic Chemistry - Bulgarian Academy of Science
Field of training	Instrumental Analysis: X-ray, IR and Raman Spectroscopy Application
Year	2004
Place	Motovun, Croatia
Institution	Faculty of Chemical Engineering and Technology in Zagreb & National Institute for Chemistry in Ljubljana
Field of training	International school of ion chromatography
Year	2000
Place	Tokyo, Japan
Institution	National Environmental Training Institute in Tokyo
Field of training	Environmental monitoring, Water Quality
Year	1998
Place	Krakow, Poland
Institution	AGH University of Mining and Metallurgy
Field of training	Characterization of coal and coke
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (5 - excellent)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	French (3 - good)
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Advanced wastewater treatment (2008-2009), lecture, postgraduate study, Faculty of Chemistry and Technology, University of Split 2. Process design, (2002- today), seminar, graduate study, Faculty of Chemistry and Technology, University of Split 3. Wastewater engineering, (2009-today), seminar, laboratory exercise, graduate study, Faculty of Chemistry and Technology, University of Split 4. Water protection (2008–today), lecture, seminar, laboratory exercise, undergraduate study, Faculty of Chemistry and Technology, University of Split 5. Industrial wastewater, (2008–today), lecture, seminar, laboratory exercise, professional study, Faculty of Chemistry and Technology, University of Split

	6. Water technology (2008), laboratory exercise, graduate study, Faculty of Chemistry and Technology, University of Split 7. Chemistry and technology of wastewater treatment, (2002-2008), seminar, laboratory exercise, graduate study, Faculty of Chemistry and Technology, University of Split 8. Water in industry (2004-2007), laboratory exercise, Faculty of Chemistry and Technology, University of Split *9.* Wastewater treatment (2004-2007), laboratory exercise, Faculty of Chemistry and Technology, University of Split
Authorship of university/faculty textbooks in the field of the course	J. Perić, N. Vukojević Medvidović, I. Nuić, Inženjerstvo otpadnih voda, Priručnik za laboratorijske vježbe, Kemijsko tehnološki fakultet Sveučilišta u Splitu, lipanj 2012. (http://www.ktf-split.hr/bib/nm/inzenjerstvo_otpadnih_voda.pdf).
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. I. Nuić; M. Trgo; J. Perić; N. Vukojević Medvidović, Analysis of breakthrough curves of Pb and Zn sorption from binary solutions on natural clinoptilolite, Microporous and Mesoporous Materials 167 (2013) 55-61 (CC). 2. M. Trgo, J. Perić, N. Vukojević Medvidović, The effect of demulsifier and dewatering agent on separation of phases from oily water, The Holistic Approach to Environment 1 (2011) 1-9. 3. N. Vukojević Medvidović, S. Maletić, J. Perić, M. Trgo, M. Ugrina, Zinc removal from aqueous solutions by precipitation and coagulation/ flocculation // Proceedings 13th Ružićka Days Today science-tomorrow industry / D. Šubarić (ed.), Faculty of food technology Osijek, Croatian Society of chemical enginering, 2011, 512-519. 4. N. Vukojević Medvidović, J. Perić, M. Trgo, Marina, M. Ugrina, M. Sikavica, Modified natural zeolite as a promising material for in situ environmental remediation//Proceedings of XIIth International Symposium Waste Management, Anić Vučinić, Aleksandra (ed.). Faculty of geotechnical engineering, Zagreb, 2012 (41-CD). 5. Lj. Šimac Peraica, N. Vukojević Medvidović, Monitoring of wastewater loading on wastewater treatment plant „Stupe“, Proceedings of the professional-business conference "Current problems in water supply and drainage", Croatian Water and Wastewater, Sv. Martin na Muri, November 2009. pp. 255-260.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	-
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	• Collaborator in project "Natural zeolite in water protection", Ministry of Science, Education and Sports of the Republic of Croatia, Croatia, 2007- 2013 (Project leader: PhD Jelena Perić, full professor) • Collaborator in project "Development of New Fe(III) Modified Natural Zeolite for Environmental Application", Bilateral project with The institute for nuclear technology and other mineral sources, Belgrade, Republic Serbia, 2008- 2010 (Project leader: PhD Marina Trgo, associate professor)
The name of the programme and the volume in which the main teacher passed exams in/acquired	-

the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	• Award of Faculty for academic year 1994/95 • Award of Faculty for academic year 1996/97 • Award of Faculty for academic year 1997/98 • Recognition for promotion of the Faculty of Chemistry and Technology in Split for academic year 2011/2012
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	-

First and last name and title of teacher	**PhD, Jelica Zelić, Full professor**
The course he/she teaches in the proposed study programme	Durability of non-metallic materials
GENERAL INFORMATION ON COURSE TEACHER	
Address	Teslina 10/V, 21000 Split
Telephone number	++385 21 348 557
E-mail address	zelic@ktf-split.hr
Personal web page	
Year of birth	1952.
Scientist ID	143203
Research or art rank, and date of last rank appointment	
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full professor in permanent position, June 28, 2013
Area and field of election into research or art rank	Scientific area of Technical science in the field of Chemical engineering, scientific branch of analysis, synthesis, and management of chemical of processes
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Chemistry and Technology in Split, University of Split
Date of employment	September 15, 1993
Name of position (professor, researcher, associate teacher, etc.)	Full professor in permanent position in Department of Inorganic Technology
Field of research	Kinetics and mechanisms of heterogenous processes in silicate, carbonate, oxide and similar systems in order to develop composite materials improved strength and durability.
Function	Head of Department of Inorganic Technology
INFORMATION ON EDUCATION – Highest degree earned	
Degree	B.Sc. in Chemical technology
Institution	Faculty of Chemical Technology University of Split
Place	Split
Date	October 27, 1976
INFORMATION ON ADDITIONAL TRAINING	
Year	1985 (a three-months scholarship)
Place	Ljubljana, R Slovenia
Institution	Institute Jožef Štefan
Field of training	Application of the electron microscopy (SEM, TEM) in the

	chemistry of cement and cement composites.
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English, (very good, 4)
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	1. Corrosion of building materials, University postgraduate study in Chemical Engineering in Materials Development and Environmental Protection, Orientation: Environmental Protection 2. Corrosion and degradation of building materials, graduate study in Chemical technology, Study Orientation: Materials 3. Corrosion of ceramic materials, undergraduate study in Chemical technology, Study Orientation: Chemical Technology Processes, Direction (Focus): Inorganic Materials.
Authorship of university/faculty textbooks in the field of the course	1. Z. Osmanović, J. Zelić, Production of Portland Cement /Proizvodnja Portland-cementa, Manualia Universitatis Studiorum Tuzlaensis, University of Tuzla, Tuzla, 2011. http://www.knjiga.ba/proizvodnja_portlandj_cementa-k7412.html 2. J. Zelić, Z. Osmanović, Strength and Durability of Cement Composites/Čvrstoća i trajnost cementnih kompozita, Manualia Universitatis Studiorum Spalatensis, University of Split, Split, 2013, peer review. 3. J. Zelić, Engineering of Selected Inorganic Materials, (in English), Manualia Universitatis Studiorum Spalatensis, University of Split, Split, 2013, peer review 4. J. Zelić, Engineering of Selected Inorganic Materials (in English), Faculty of Chemical and Technology in Split, Split, 2013 (reviewed and edited teaching materials), http:// www.ktf-split.hr/bib/nm/Inzenjerstvo _odabranih_ anorganskih_materijala_en.pdf 5. J. Zelić, Practicum in the processes of inorganic industry /Praktikum iz procesa anorganske industrije, Faculty of Chemical and Technology in Split, Split, 2013 (reviewed teaching materials), http:// www.ktf-split.hr/bib/nm/Procesi _anorganske_ industrije.pdf.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	1. M. N. Mužek, S. Svilović, J. Zelić, Fly ash-based geopolymeric adsorbent for copper ion removal from wastewater, Desalination and Water Treatment (2013), in the publishing process 2. D. Jozić, J. Zelić, I. Janjatović, Influence of the coarse fly ash (Class F) on the mechanical properties of the cement mortars, Ceramics-Silikáty, 2 (2010) 144-151. 3. J. Zelić, D. Jozić, D. Krpan-Lisica, Synergistic action of a ternary system of Portland cement-limestone-silica fume in concrete, in Book: Nanotehnology in Construction 3, (eds.) Z. Bittnar et al., (Publ.) Springer-Verlag Berlin Heidelberg (2009), pp. 425-434.

	4. J. Zelić, J. Ninčević, D. Jozić, D. Krpan-Lisica, Ponašanje portland cementnog morta s dodatkom letećeg pepela u okolišu sulfata, Međunarodna konferencija MATRIB 2008, Knjiga radova, (ur.) K. Grilec, G. Marić, S. Jakovljević, Zagreb (2008) 412-420. 5. J. Zelić, I. Radovanović, D. Jozić, The effect of silica fume additions on the durability of Portland cement mortars exposed to magnesium sulfate attack, Materials & Technology, 41 (2007) 91-93.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

3.4. Optimal number of students

The proposed admission quota for the undergraduate study programme Protection and Recycling of Materials is 30 students. In accordance with the expressed interest and the needs of the community, the Faculty Council may change the admission quota.

3.5. Estimate of costs per student

The planned source of financing for the professional study programme Protection and Recycling of Materials is the Ministry of Science, Education and Sports. The Faculty of Chemistry and Technology currently offers professional study programme in Chemical Technology with two major fields of study: Chemical Technology and Materials and Food Technology. The study programme is fully financed by the Ministry of Science, Education and Sports.
Admissions quotas for those study programmes are 20 students (Chemical Technology and Materials) and 30 students (Food Technology). With introduction of the study programme Protection and Recycling of Materials, the existing professional study programme would be

terminated; therefore the introduction of the new programme would not require any additional funds.

3.6. Plan of procedures of study programme quality assurance

In keeping with the European standards and guidelines for internal quality assurance in higher education institutions (according to "Standards and Guidelines of Quality Assurance in the European Higher Education Area") on the basis of which the University of Zagreb defines procedures for quality assurance, the proposer of the study programme is obliged to draw up a plan of procedures of study programme quality assurance.	
Documentation on which the quality assurance system of the constituent part of the University is based:	
• Regulations on the quality assurance system of the constituent part (enclose if existing)	
• Handbook on the quality assurance system of the constituent part (enclose if it exists)	
Description of procedures for evaluation of the quality of study programme implementation: • Fore each procedure the method needs to be described (most often questionnaires for students or teachers, and self-evaluation questionnaire), name the body conducting evaluation (constituent part, university office), method of processing results and making information available, and timeframe for carrying out evaluation • If procedure is described in an attached document, name the document and the article.	
Evaluation of the work of teachers and part-time teachers	
Monitoring of grading and harmonization of grading with anticipated learning outcomes	
Evaluation of availability of resources (spatial, human, IT) in the process of learning and instruction	
Availability and evaluation of student support (mentorship, tutorship, advising)	
Monitoring of student pass/fail rate by course and study programme as a whole	
Student satisfaction with the programme as a whole	
Procedures for obtaining feedback from external parties (alums, employers, labour market and other relevant organizations)	
Evaluation of student practical education (where this applies)	
Other evaluation procedures carried out by the proposer	
Description of procedures for	

informing external parties on the study programme (students, employers, alums)	