University of Zagreb
Faculty of Chemical
Engineering and Technology

FKITMCMXIX

SELF-EVALUATION REPORT OF THE POSTGRADUATE UNIVERSITY PROGRAMME OF STUDY: CHEMICAL ENGINEERING AND APPLIED CHEMISTRY

Zagreb, November 3, 2017

University of Zagreb
Faculty of Chemical
Engineering and Technology

FKITMCMXIX

Class: 003-01/17-02/2
Reg. Number: 251-373-1-17-3

Zagreb, November 3, 2017

Name of the evaluated higher-education institution:
University of Zagreb, Faculty of Chemical Engineering and Technology

Name of the University the evaluated higher-education institution is a component of:
University of Zagreb

Year of Establishment:
1919

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Academic rank, first and second name of the head of the higher-education institution:
Dean, Prof. Tomislav Bolanča, Ph.D.

Name of the bank and the business account number of the higher education institution:
Zagrebačka banka, IBAN: HR7223600001101338626

Members of the Commission for Preparation of Self-Evaluation Report of the doctoral study programme Chemical Engineering and Applied Chemistry of the Faculty of Chemical Engineering and Technology of the University of Zagreb were nominated by the Dean's decision on May 6, 2016. (Class: 602-04/16-04/1; Reg. Number: 251-373-1-16-2).

Members of the Commission:

Prof. Sandra Babić, Ph.D.
Assoc. Prof. Jelena Macan, Ph.D.
Prof. Silvana Raić-Malić, Ph.D.
Prof. Marko Rogošić, Ph.D.
Monika Šabić, mag. ing. oecoing.
Assoc. Prof. Irena Škorić, Ph.D.
Prof. Vesna Tomašić, Ph.D.
Prof. Bruno Zelić, Ph.D.

Coordinator of the Preparation of Self-Evaluation Report:
Prof. Marko Rogošić, Ph.D.

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I. General information and execution requirements for the programme of study

Name of the programme of study: Chemical Engineering and Applied Chemistry
Holder: Faculty of Chemical Engineering and Technology of the University of Zagreb
Provider: Faculty of Chemical Engineering and Technology of the University of Zagreb
Field and academic area: Technical Sciences, academic area of Chemical Engineering
Natural Sciences, academic area of Chemistry
Location: Zagreb
Number of doctoral students: 50
Number of teachers in the doctoral programme of study: 66
Number of mentors in the doctoral programme of study: 21 (A relatively small number of doctoral students results from the fact that only two generations of students have been enrolled to date. Of 50 doctoral students, only 15 candidates have submitted their applications for doctoral dissertation topics.)
Note: The programme of study Chemical Engineering and Applied Chemistry is the only doctoral programme of study of the Faculty of Chemical Engineering and Technology of the University of Zagreb (hereinafter: the Faculty), formed when the two previous programmes of study Chemical Engineering and Engineering Chemistry were integrated with the aim of enhancing recognisability and rationalising research-related and staffing resources. The previous programmes are active only to the extent in which they allow the doctoral students enrolled in former programmes to complete the said programmes within the deadlines foreseen. The second generation of doctoral students was enrolled in the new programme of study in the academic year 2015/2016. No new doctoral students have attained the PhD degree yet or accumulated sufficient scientific productivity for any coherent evaluation. Consequently, the numerical parameters, as well as the cases outlined, largely concern the previous programmes of study as the precursors of the programme analysed herein.

1. STRUCTURE OF THE DOCTORAL PROGRAMME

Form of activity	Description of activity		ECTS	ECTS compulsory	TOTAL ECTS compulsory
Doctoral dissertation	Research, development and defence of doctoral dissertation		120	120	**120**
Public presentation of the doctoral dissertation topic			5	5	**5**
Instruction	Fundamental course	2 courses	6	12	**30**
	Elective course	3 courses	6	18	
Other compulsory forms of work	Research seminar paper		2	13	**25**
	Workshop	Generic skills	2		
	Discussion group		2		
	Paper published in a journal cited in tertiary database		5		
	Participation in scientific conferences with a report		2		
Other optional forms of work	Additional elective course	Maximum 1	6	-	
	Published scientific paper	CC, SCI, SCIex	5	-	
		Other databases	2	-	
		Paper in the Book of Proceedings (reviewed)	1	-	
	Professional development	Visits to other institutions	1 ECTS per month of visit	-	
	Summer school		2	-	
				TOTAL	**180**

2. LEARNING OUTCOMES

Adapted in line with the document *EFCE Bologna Recommendations: Recommendations for Chemical Engineering Education in a Bologna Three Cycle Degree* System.[1]

Learning outcomes at the level of study programme

1. To systematise knowledge, skills and competences for the respective field and academic area of the programme of study
2. To evaluate the skills and methods for experimental and theoretical research relating to the respective field and academic area of the programme of study
3. To design a real research process, including all the respective professional and scholarly aspects
4. To conduct large-scale scientific research extending the frontiers of technology and knowledge
5. To publicise segments of the original scientific research in refereed international publications or patent offices
6. To develop a plan of research and of required resources in international context
7. To communicate with their peers, the larger international scholarly community and with society in general about their ideas or the field of their scholarly and professional interest
8. To promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge-based society.

Link of the particular elements of structure of the doctoral programme with the learning outcomes on the programme level

FORM OF ACTIVITY	LEARNING OUTCOMES ON THE LEVEL OF PROGRAMME
Doctoral dissertation	3, 4, 5, 6, 7, 8
Public presentation of the doctoral dissertation topic	3, 6, 7, 8
Instruction	
Fundamental courses	1, 2, possibly 7
Elective courses	1, 2, possibly 7
Other compulsory forms of work	
Research seminar paper	3, 6, 7, 8
Workshop	Depending on the type of workshop, linked with outcomes 1, 2, 5, 7 or 8 or others
Discussion group	1, 2, 7, 8
Paper published in a journal cited in tertiary database	2, 3, 4, 5, 6, 7, 8, particularly 5
Participation in scientific conferences with a report	3, 4, 5, 6, 7, 8, particularly 7 and 8
Other optional forms of work	
Additional elective course	Depending on the course, linked primarily with outcomes 1 and 2
Published scientific paper	2, 3, 4, 5, 6, 7, 8, particularly 5
Professional development	1, 2, 7, possibly 4
Summer school	1, 2, 7

Fundamental courses

T-101
Vesna Tomašić, Zoran Gomzi, Igor Plazl
Chemical reactor analysis and modelling
1. To propose a mathematical model of a chemical reactor based on physical picture of a process and assumptions about the dependence of states and parameters on the reactor space and time. 2. To judge critically the impact of forms of kinetic models of chemical reactions and processes of mass and heat transfer to the complexity of the reactor model. 3. To assess the parameters of complex kinetic models using the ID algorithm (modified differential method). 4. To analyse the reaction-diffusion dynamics in a microreactor. 5. To compare 1D and 2D heterogeneous models of monolithic reactors used for the catalytic reduction of nitrogen oxides with respect to their applicability. 6. To choose an appropriate numerical method for solving a reactor model described by partial differential equations.

T-103
Đurđa Vasić-Rački, Zvjezdana Findrik Blažević, Ana Vrsalović Presečki, Bruno Zelić
Biochemical engineering
1. To setup the design-of-experiments with the aim of optimising the conditions of biotransformation processes using stochastic and statistical methods. 2. To estimate kinetic parameters of a biochemical reaction on the basis of experimental data. 3. To develop mathematical models of biotransformation processes for different types of bioreactors. 4. To calculate the consumption of biocatalysts and volume productivity for a given reaction system and different types of bioreactors. 5. To select the most suitable type of bioreactor for a given reaction system based on the results of the experiment and the simulation results of a mathematical model of the process. 6. To conduct economic and environmental analysis of biotransformation processes.

T-104
Marko Rogošić
Chemical engineering thermodynamics
1. To formulate expressions for the estimation of thermodynamic properties of real gases in systems related to the topic of the candidate's dissertation. 2. To create expression for the estimation of thermodynamic properties of real solutions in systems related to the topic of the candidate's dissertation. 3. To set up a system of nonlinear equations for the description of phase or chemical equilibria related to the topic of the candidate's dissertation. 4. To select the appropriate numerical methods for solving problems defined by the first three outcomes. 5. To prepare the seminar in the field of chemical engineering thermodynamics related to the topic of the candidate's dissertation.

T-105
Aleksandra Sander
Separation processes
1. To select the appropriate separation process based on the physico-chemical properties of the system and the corresponding phase equilibria. 2. To analyse thermal separation processes applied in the pharmaceutical and petroleum and petrochemical industry. 3. To identify the separation problem together with expressing it in a mathematical form. 4. To select the appropriate equipment for the separation of multi-component systems in the chemical process industry. 5. To combine empirical rules with scale-up rules for preliminary calculations of separation processes. 6. To assess the possibilities of energy saving and the impact of separation processes on the environment.

T-106
Jasna Prlić Kardum
Transport phenomena
1. To apply the dimensional analysis method and the method of approximation to the mass and energy transfer in systems with different geometrical characteristics. 2. To foresee the phenomena that might occur in the system under the conditions of simultaneous transfer of momentum, heat and mass. 3. To solve mathematically the problem involving the transfer phenomena related to the topic of the candidate's dissertation. 4. To analyse the role of the transfer of momentum, heat and mass in individual unit operations. 5. To combine knowledge about the phenomena of transfer in order to propose new solutions of engineering problems.

T-107
Ivica Gusić
Elements of engineering mathematics
1. To comment the division of linear partial differential equations into the hyperbolic, parabolic and elliptic ones with respect to specific engineering problems where they are met. 2. To formulate the concept of initial and boundary conditions with respect to their type and the impact on the solution of differential equations. 3. To select a suitable method, exact or numerical, to solve mathematical problems (ordinary or partial differential equations, systems of linear or algebraic equations). 4. To compare diffusion equation with the equation of heat conduction with generalization of the analogy between different mathematical or engineering problems. 5. To analyse various computer packages according to their suitability for solving a specific problem in the domain of engineering mathematics.

T-109
Sandra Babić
Chemical analysis in quality system
1. To analyse the analytical chemical system in order to determine the possible sources of error. 2. To plan a chemical analysis that will result in reliable analytical results. 3. To assess the quality of analytical results. 4. To assess the existing quality (assurance) system in chemical laboratories. 5. To create one's own quality management system in the chemistry lab.

T-110
Tomislav Bolanča
Water chemistry
1. To interpret physico-chemical interactions in the aqueous medium with respect to their influence on the properties of aqueous solutions. 2. To select the most appropriate modern analytical techniques for obtaining targeted information about the properties of the aqueous medium. 3. To liaise the specific composition of the water (dissolved substances, pollutants, minerals ...) with possible water treatment technologies. 4. To determine the factors regulating the chemical composition of natural waters. 5. To evaluate engineering and social aspects of the problem of water resources management.

T-111
Marijana Hranjec, Tatjana Gazivoda Kraljević, Silvana Raić-Malić, Irena Škorić
Heterocycles: current trends and future perspective
1. To evaluate critically chemical properties and reactivity of heterocycles considering the type of heteroatoms in the structure. 2. To create synthetic routes for given classes of heterocyclic compounds to be used in the candidate's own research, along with the subsequent interpretation of the proposed routes. 3. To evaluate proposed methods for the synthesis of heterocyclic compounds. 4. To suggest pharmacophores in bioactive heterocyclic natural and synthetic products based on candidate's own previous research. 5. To evaluate the importance of the application of heterocyclic compounds in industry and technology. 6. To present systematized results of the literature survey on heterocycles to competent audience.

T-112
Irena Škorić, Tatjana Gazivoda Kraljević, Marijana Hranjec, Silvana Raić-Malić
Modern trends in organic synthesis
1. To compare critically the cross-coupling reactions catalysed by transition metals (Pd, Ni and Cu). 2. To discuss the metathesis reactions of alkanes, alkenes and alkynes. 3. To recommend the application of an appropriate modern method for the synthesis of target compound with reference to the reaction mechanism. 4. To conceive methods of green organic chemistry rather than the selected methods of conventional synthesis with a view to their application in industry and technology. 5. To present the examples of combining modern methods of synthesis of a given compound to competent audience.

T-113
Saša Omanović, Zoran Mandić, Marijana Kraljić Roković
Electrochemistry and materials of electrochemical conversion and storage devices
1. To assess the possibility of applying certain materials for the electrochemical storage and conversion of energy 2. To implement conclusions about the properties of materials based on findings related to the thermodynamics and kinetics of electrode reactions. 3. To create electrochemical experiments for the synthesis and characterization of electrochemically active materials. 4. To analyse and interpret the data obtained in electrochemical experiments. 5. To design new advanced materials and technology that can be used in the development of electrochemical energy converters and storage devices. 6. To calculate characteristic values associated with electrochemical converters and storage devices based on data obtained by electrochemical measurements.

T-114
Ana Lončarić Božić, Hrvoje Kušić
Environmental management tools
1. To connect the causes and consequences of environmental pollution in the framework of the environmental impact assessment. 2. To envision significant impacts based on examples of formal description of environmental interventions, along with the assessment of the impacts. 3. To recommend measures regarding the management of environmental aspects by applying the methodology of ISO 14001 Environmental Management System. 4. To identify specific hazards to human health and the environment related to the activities of chemical industry as well as the appropriate safety precautions. 5. To link elements of cleaner production, environmental management systems and eco-management and audit scheme with a view to continuous improvement of the efficiency of work in accordance with the requirements of environmental protection.

T-116
Hrvoje Ivanković, Stanislav Kurajica
Inorganic nonmetalic materials
1. To analyse correlations between structure and physico-chemical properties of inorganic non-metallic materials. 2. To propose methods of investigation of the structure, microstructure and properties of inorganic non-metallic materials. 3. To interpret phase diagrams of condensed systems. 4. To compare kinetic models for solid-state reactions. 5. To choose parameters of methods for the experimental investigation of high-temperature reactions. 6. To evaluate properties of inorganic materials and composites with respect to specific applications.

T-117
Marica Ivanković, Marko Rogošić, Ljerka Kratofil Krehula
Polymer chemistry and engineering
1. To analyse the assumptions of the existing models of polymer chains in comparison to the real polymer chains. 2. To evaluate different theories of polymer solutions in the description of properties of real polymer solutions. 3. To predicting the impact of the molecular weight and details of structure of polymer molecules on different application properties of polymeric materials. 4. To compare the polymerization processes in the laboratory and industrial scale in view of the reaction parameters, mechanisms and properties of the products obtained. 5. To evaluate interactions in multicomponent polymer systems with respect to the miscibility, compatibility and surface phase effects. 6. To plan processes for modifying natural and synthetic polymer systems in order to promote target properties.

T-118
Vladimir Dananić, Mile Ivanda, Sanja Lučić Blagojević, Mirela Leskovac
Physics and chemistry of nanostructured surfaces and materials
1. To analyse the quantum mechanical models at the nano-level in order to predict the properties of surfaces and materials. 2. To calculate wave functions and energy spectra of nano-objects. 3. To select the method of preparation of nanostructured materials with respect to their final use. 4. To choose the method of characterization of nanostructured materials with respect to the analysis of their structure. 5. To evaluate the role of interfacial interactions on the properties of nanostructured materials. 6. To link the way of modifying the surface and the interface with the properties of nanostructured materials.

Elective courses

I-201
Gordana Matijašić
Engineering of particulate systems
1. To analyse the particulate systems and methods for their characterization. 2. To calculate the kinetics of comminution process by matrix approach and population balances. 3. To connect the mechanisms of comminution with their mathematical records in the population balance. 4. To analyse the conversion in the process of granulation. 5. To propose a solution of a specific separation problem involving depth filtration. 6. To select the type of device for comminution and granulation according to set criteria.

I-202
Igor Dejanović
Synthesis and process design
1. To apply the process simulators for modelling processes of the chemical industry of varying degrees of complexity on the basis of available data. 2. To develop the process flowsheet for the production of selected product. 3. To develop the superstructure of a chemical industry process for the purpose of structural optimisation of the process flowsheet. 4. To evaluate the methods and techniques of process synthesis in the chemical industry leading to the optimal use of materials and energy in processes 5. To evaluate the different approaches to the optimisation of chemical industry processes. 6. To analyse an existing chemical industry process by methods of engineering economic analysis.

I-203
Veljko Filipan, Igor Sutlović
Energetics and the environment
1. To interpret trends in energy consumption by category in the world and Croatia. 2. To present how individual energy conversion processes affect the environment. 3. To analyse the possibilities for substitution of non-renewable energy sources with renewable ones with emphasis on technical and financial aspects. 4. To discuss the importance of high-quality supply of production processes by energy and energy generating products. 5. To apply the acquired knowledge in the analysis of the possibility of increasing the energy efficiency of specific industrial processes. 6. To conceive measures to improve energy efficiency by evaluating different proposed solutions with respect to the technical, economic and environmental criteria.

I-204
Elvira Vidović
Modern petroleum refining and petrochemical processes
1. To compare the advantages and disadvantages of existing conventional fossil raw materials and alternative raw materials for the refinery and petrochemical industries. 2. To comment improvements introduced in the modern petroleum and petrochemical processes from the standpoint of quality and product yield. 3. To evaluate the impact of legislation (environmental requirements) on the development of modern petroleum refining and petrochemical processes. 4. To draw conclusions on the economic aspects of introduced modifications to existing oil and petrochemical processes. 5. To comment the economic aspects of the design and construction of plants based on new technologies.

I-205
Damir Kralj, Jasna Prlić Kardum
Crystallisation
1. To apply theoretical knowledge in the field of heterogeneous solid-liquid systems and industrial crystallisation to the topic of the candidate's dissertation. 2. To prepare a literature survey in the field of crystallisation related to the topic of the candidate's dissertation. 3. To select the mode of implementation of crystallisation depending on the thermodynamic properties of the system. 4. To judge critically how the induced oversaturation affect different stages of the crystallisation process and the properties of the final product. 5. To propose appropriate equipment necessary for the implementation of a particular mode of crystallisation.

I-206
Nenad Bolf
Process and plant automatization
1. To identify the parameters and dynamic characteristics of the process for optimal functioning of the regulator. 2. To design a system for automatic process control for laboratory and industrial applications. 3. To develop a strategy of predictive process control. 4. To design intelligent transducers, soft sensors and virtual instrumentation for use in modern control systems. 5. To apply artificial intelligence methods in the development of advanced control of industrial processes. 6. To evaluate critically the functioning of process control systems and its components on the basis of the testing results.

I-207
Tomislav Bolanča, Šime Ukić
Chemometrics
1. To apply mathematical and statistical methods to design or create optimum measurement or experiment. 2. To apply mathematical and statistical methods to obtain the maximum amount of useful information from a limited number of data. 3. To use the tools of artificial intelligence for modelling and optimisation of chemical and related systems. 4. To predict the properties of molecules by the calculations based on the molecular structure. 5. To synthesise the obtained useful information into new concepts.

I-208
Silvana Raić-Malić, Marijana Hranjec, Tatjana Gazivoda Kraljević
Medicinal chemistry
1. To analyse critically medications according to the targets of their action. 2. To interpret the mechanism of action of drugs with respect to their interaction with the receptor (enzyme) and/or DNA/RNA. 3. To compare substrates and inhibitors of the enzyme in the strategy of drug development. 4. To compare medicines developed by the rational approach based on their mechanisms of action with the older drugs and their newly discovered mechanisms of action. 5. To connect the structural features of drugs with their biological properties. 6. To present the mechanism of biological action based on the structure of the suggested compound to the competent audience.

I-209
Irena Škorić
Principles and applications of organic photochemistry
1. To present the selection rules based on the permitted and forbidden electron transitions. 2. To explain the shifts of electron transitions caused by substitution, conjugation and polarity of the solvent. 3. To present absorption, and processes without and with radiation using the Jablonski diagram. 4. To judge critically the quantum yields and mechanisms of deactivation processes with radiation (fluorescence and phosphorescence) taking into account the electronic configuration of the excited state, substitution effect and the rigidity of the molecule. 5. To compare the ways of deactivation of excited states by the mechanisms of intramolecular process without radiation and intermolecular physical processes. 6. To discuss the differences in the reaction curves of photochemical reactions and reactions in the ground state. 7. To envision the possible photoproducts of the selected alkenes and aromatic compounds based on the structure and reaction conditions. 8. To foresee the products of the reactions of selected carbonyl compounds in the excited state based on the knowledge of all the characteristic mechanisms. 9. To argue all the aspects of the application of photochemistry as supported by the examples.

I-210
Mira Petrović, Sandra Babić
Chromatographic methods in environmental analysis
1. To analyse the advantages and disadvantages of certain chromatographic techniques and methods of detection based on the properties of the sample analysed. 2. To analyse the advantages and disadvantages of coupled systems chromatography-mass spectrometry (ionization methods, mass analysers) with regard to the characteristics of the sample analysed. 3. To evaluate published chromatographic methods with an aim to adjust them to fit to the topic of the candidate's dissertation. 4. To create the optimal chromatographic method (separation and detection) for the analysis of environmental samples. 5. To evaluate critically the results of the chromatographic analysis.

I-211
Dragana Mutavdžić Pavlović
Modern sample preparation techniques for chromatographic analysis
1. To connect the fundamental principles of sample preparation with the topic of the candidate's own research with a view to their implementation in the chromatographic analytical procedures. 2. To assess the value of the data obtained by the literature survey in the field of chromatography. 3. To optimise the sample preparation process in order to obtain more meaningful information about the sample. 4. To improve existing or devise new chromatographic analytical method based on knowledge of modern methods of sample preparation. 5. To compare the advantages and disadvantages of different methods of preparing samples for chromatographic analysis with regard to the physical state of the sample. 6. To analyse problems in chromatographic analysis of samples extracted from the environment based on the state of the sample, the composition of the matrix and the measured analyte, as well as possible solutions to these problems.

I-212
Predrag Novak
Principles and applications of NMR spectroscopy
1. To interpret the principles and basic parameters of NMR. 2. To compare the basic one- and two-dimensional NMR techniques. 3. To propose NMR techniques in the structural analysis of molecules with examples of interpretation of spectra. 4. To select the NMR technique for studying ligand-receptor interactions. 5. To explain the techniques of solid state NMR and coupled LC-NMR techniques in the analysis of the mixtures of compounds. 6. To assess the importance and role of the individual NMR techniques for application in the industry.

I-213
Nikola Basarić
Principles and applications of fluorescence spectroscopy
1. To envision photophysical properties based on knowledge on the primary photophysical processes and molecular structure of the fluorophores. 2. To plan measurements of stationary and time-resolved fluorescence with the use of appropriate measurement instrumentation. 3. To anticipate the possibility of formation of complexes in the excited state and the influence of solvent polarity on the process of deactivation of the excited state. 4. To invent fluorescence quenching experiments in order to determine the applicable mechanisms of extinction. 5. To propose chromophoric systems exhibiting resonance energy transfer properties for use in various fluorescent sensors. 6. To plan experiments measuring fluorescence anisotropy in order to develop analytical methods that measure stationary or time-dependent fluorescence.

I-214
Vesna Volovšek, Mira Ristić
Spectroscopic methods in materials research
1. To apply methods of vibrational and electronic spectroscopy for the studies of materials. 2. To analyse vibrational spectra (FT-IR, Raman) to determine the composition and structure of materials. 3. To apply electronic spectroscopy (UV, Vis, NIR) to determine the optical properties of materials. 4. To investigate magnetic and structural properties of materials by the Mössbauer spectroscopy. 5. To determine the phase content and chemical composition of materials at the micro- and nano-level. 6. To compare the results of complementary spectroscopic techniques.

I-216
Marija Vuković Domanovac
Processes of treatment of waste streams and bioremedy of environment
1. To distinguish the sources and causes of pollution having in mind the preventive approach to environmental protection. 2. To distinguish microorganisms and microbial processes responsible for waste streams treatment and environmental bioremediation. 3. To classify features and application range of the basic types of biological reactors. 4. To select the appropriate type of the reactor with respect to the characteristics of the waste stream, the features of the process, the reaction rate and operating conditions. 5. To recommend an acceptable biological treatment process in dealing with environmental engineering problems set by the project design task referring to sustainable development.

I-217
Krešimir Košutić, Danijela Ašperger
Physical-chemical treatment of water
1. To define the type of water and equilibrium chemical processes in the water. 2. To assess when and how the methods of water softening and disinfection should be applied. 3. To evaluate the physico-chemical methods of water treatment – ion exchange, coagulation, flocculation, adsorption, membrane processes. 4. To estimate which physico-chemical methods of treatment of drinking and wastewater are to be used, for example, in water supply and water management companies and in the industry. 5. To plan experimental studies in laboratory and pilot scale based on the knowledge of the physico-chemical treatment of water. 6. To present a literature survey of the research related to the physical-chemical treatment of water to the competent audience.

I-218
Ana Lončarić Božić, Hrvoje Kušić
Advanced oxidation processes for water treatment
1. To analyze the effects of process conditions on the efficiency of water treatment by advanced oxidation processes. 2. To justify the selection of advanced oxidation processes for water treatment with regard to the characteristics of present pollutants. 3. To connect the mechanisms of degradation of organic pollutants with increased biodegradability and reduced toxicity of wastewater. 4. To predict inhibiting effect of the media in the practical application of advanced oxidation of water treatment processes. 5. To propose effective processing technology based on the characteristics of real wastewater and quality requirements of treated water.

I-219
Gordana Pehnec
Managing air quality
1. To describe the key atmospheric processes and reactions responsible for the spread of pollutants in the atmosphere. 2. To analyse data on the concentrations of pollutants with respect to the spatial and temporal distribution. 3. To select the most suitable analytical method or model for determination of general and specific contaminants in the air. 4. To evaluate the quality of ambient air with respect to the current legislation. 5. To form strategy for improving air quality by respecting the principles of sustainable development. 6. To organise advanced databases on air quality.

I-221
Zlata Hrnjak-Murgić, Juraj Šipušić
Recycling of polymer and inorganic waste
1. To foresee the application properties of polymeric materials based on the data on their synthesis and processing. 2. To evaluate the existing systems for plastic waste disposal. 3. To evaluate the technologies of pretreatment of plastic waste (aimed for recycling) as well as the technologies of recycling of plastic waste. 4. To correlate the structure and properties of inorganic binders. 5. To choose the composition of the mineral binder for the preparation of materials with targeted properties. 6. To provide long-term application properties of the inorganic systems for the stabilization/solidification of waste material. 7. To select suitable kinetic models to describe the leaching of toxic components from solidified waste material.

I-222
Emi Govorčin Bajsić
Structure and processing of polymer materials
1. To compare the supermolecular structure of isotropic polymers with the supermolecular structure of oriented, anisotropic polymers. 2. To distinguish nano-, micro- and macrophase structure of polymer materials. 3. To plan polymer processing methods depending on the basic features of polymer structure. 4. To tailor the structure and properties of polymers during their processing. 5. To evaluate the impact of the characteristics of processing methods and processed material on the rheological behaviour, heat transfer, molecular structuring and product properties. 6. To distinguish basic types of degradation and their mechanisms during production and processing of polymer materials.

I-223
Sanja Lučić Blagojević, Mirela Leskovac
Adhesive processes and systems
1. To analyse the interdependence of the phenomena of wetting and adhesion as functions of the properties of the system. 2. To define the optimal adhesion of the selected system with respect to the desired application properties and calculated adhesion parameters. 3. To connect the interface properties with the properties of adhesive (glued) joints in the application. 4. To select the appropriate adhesive on the basis of physical and chemical mechanisms of its curing. 5. To conclude on the application properties of the adhesive on the basis of the results of laboratory tests. 6. To select components of an adhesive formulation, depending on the targeted application.

I-224
Domagoj Vrsaljko, Mirela Leskovac
Engineering of boundary surfaces and tribology
1. To analyse the impact of surface and interfacial phenomena on the application properties of the material. 2. To estimate the properties of the material in the set application conditions based on the thermodynamic principles and corresponding calculations. 3. To connect mechanisms of friction and wear with the structure and tribological properties of materials in the application. 4. To recommend appropriate testing methods of surface properties of materials together with the evaluation of their results. 5. To propose appropriate surface modification in order to improve the tribological properties of the material. 6. To liaise the key parameters of adhesion, friction and wear with optimum material properties in the application.

I-225
Marica Ivanković
Polymer composite materials
1. To validate polymer composites in the selection of materials. 2. To envision the corresponding modification of the boundary surface (matrix/filler, reinforcement) to obtain the desired material properties. 3. To validate kinetic and chemorheological models for the curing processes of thermoset systems. 4. To comment TTT diagrams for the selection of optimal conditions of processing of thermoset systems. 5. To establish the advantages and disadvantages of different methods of preparation of (nano) composites and organic-inorganic hybrids.

I-226
Hrvoje Ivanković, Lidija Ćurković
New ceramic materials and ceramic processing
1. To analyse the correlation between the chemical composition, structure and physico-chemical properties of advanced ceramic materials. 2. To foresee the potential application of new ceramic materials in the field of new technologies and sustainable development. 3. To propose methods for investigating structure, microstructure and properties of advanced ceramic materials. 4. To select the processing method and processing parameters for the creation of new ceramic materials/systems with targeted properties. 5. To validate the properties of new ceramic materials and composites with respect to specific applications.

I-227
Stanislav Kurajica, Hrvoje Ivanković
Silicates and silicate glasses
1. To correlate the structure and properties of silicate minerals. 2. To analyse the technical features of important silicate systems. 3. To select a silicate or silicone material for a specific purpose. 4. To foresee the potential application of silicate materials in the field of molecular nanotechnology. 5. To select the proper recipe for glass or glass-ceramics to create the material/system with targeted properties. 6. To select a suitable kinetic model for the crystallization of the glass.

I-228
Saša Omanović
Chemical approach to nanotechnology: fundamentals and applications
1. To categorize different nanomaterials used in certain areas of science or in everyday applications. 2. To evaluate nanomaterials in the fields of electrochemical systems for energy production, wastewater treatment, detection of molecules (sensors) and medical applications. 3. To interpret theoretical fundamentals of a series of experimental techniques used to characterize nanomaterials. 4. To choose experimental techniques suitable for characterizing nanomaterials with respect to targeted properties. 5. To interpret experimental results obtained using the techniques for characterization of nanomaterials.

I-229
Sanja Martinez, Helena Otmačić Ćurković
Recent issues in the field of corrosion
1. To present the latest findings from the selected area of corrosion problems based on a survey of relevant literature. 2. To evaluate critically the applicability and relevance of certain experimental techniques in the analysis of the selected corrosion problems. 3. To analyse the possibility of occurrence of various types of corrosion defects in the given corrosion conditions. 4. To predict the mechanism of corrosion processes in particular corrosion environments. 5. To evaluate the applicability of some of the new methods of corrosion protection in certain corrosion conditions.

I-230
Stjepan Milardović, Ivana Steinberg
Chemical sensors and biosensors
1. To select the appropriate enzyme, the method for its immobilization as well as the transmitter of electrons from the enzyme to the measuring electrode with respect to the targeted biosensor analysis. 2. To determine the operating mode of the biosensor considering the type of the analyte and interfering substances present in the measured sample. 3. To construct the biosensor for one or severyl analytes. 4. To select the type of transducer (amperometric, potentiometric, optical, temperature, etc.) with respect to the required final characteristics of the sensor. 5. To choose home-made or commercially available sensors and biosensors for use in flow-through and non-flow-through analytical systems. 6. To design home-made flow-through and non-flow-through analytical systems based on sensors and biosensors.

I-231
Ante Jukić, Zvonimir Glasnović
Sustainable solar-hydrogen systems
1. To evaluate critically the advantages and disadvantages of solar-hydrogen system. 2. To select the solar-hydrogen system adequate to the energy, environmental and economic requirements. 3. To select and justify development tasks for the improvement of solar-hydrogen system from the viewpoint of a particular module or the entire system. 4. To set the hypotheses and to envision the research and development project in the field of solar-hydrogen system. 5. To judge the reliability, feasibility and usefulness of new technologies in the field of solar-hydrogen system.

I-232
Mirjana Metikoš-Huković
Semiconductor materials
1. To analyse semiconductor materials based on the band theory of solids aiming at their comparison with metallic materials. 2. To comment charge transfer mechanisms in selected examples of semiconductors of n- and p-type conductivity (Si, GaAs) in connection to their applications in semiconductor technology. 3. To rank semiconductor materials according to the efficiency of conversion of solar energy into electrical energy in photovoltaic and photoelectrochemical reactors, and according to their joining with metals into Schottky diodes. 4. To foresee the stability of binary semiconductor compounds (oxides of metals and elements of groups 13-15) towards anode and decomposition and photodecomposition. 5. To characterize the selected semiconductor according to the type of conductivity, the concentration of charge carriers, the width of the forbidden zone and flat band potential. 6. To evaluate proposed semiconductor material with regard to its application in photocatalytic processes for wastewater treatment.

I-233
Ingrid Milošev
Biomedical implant materials
1. To analyse the impact of material properties on its selection for specific biomedical applications. 2. To divide into steps the process of development of biocompatible materials for use in biomedical research from *in vitro* to clinical use. 3. To evaluate the techniques and methodologies for the study of materials *in vitro* with regard to estimating their advantages and drawbacks. 4. To estimate the interaction of certain biomaterials with biological environment. 5. To identify and categorize procedures, and methodology for functionalizing the surface of biomaterials in order to minimize unintended consequences.

I-234
Simon M. Ametamey, Silvana Raić-Malić
Positron emission tomography (PET) chemistry and PET radiopharmaceuticals
1. To compare different PET radionuclides according to the production method and physical properties. 2. To classify radiohalogens with application in imaging. 3. To recommend appropriate radionuclide with respect to its use in visualization in oncology. 4. To invent multistep synthesis for the labeling of compounds with the radionuclide ^{18}F. 5. To evaluate the proposed synthetic pathways in the labeling of target compound with radionuclides ^{18}F and ^{11}C with respect to their feasibility.

I-235
Jadranka Travaš-Sejdić, Zlata Hrnjak-Murgić, Ljerka Kratofil Krehula
Functional polymer materials
1. To connect the knowledge in the field of polymer synthesis, synthesis and preparation of polymeric nano(composites) and processing of polymers with the use of materials with respect to the targeted functional property. 2. To assess the biocompatibility and the possible adverse effects on human health of functional polymer materials, as well as their impact on the environment. 3. To validate the theoretical and experimental investigations in the field of multiphase polymer systems. 4. To evaluate thermodynamic compatibility of components in the system, mechanisms of their synthesis and mechanisms of their action. 5. To evaluate appropriate characterization techniques for the evaluation of the functional and other properties of materials. 6. To select the appropriate experimental process for the preparation of polymer materials with functional properties.

I-236
Mirela Samardžić
Chemical analysis of surfactants
1. To distinguish types of surfactants with respect to their structure and role in industrial products. 2. To compare the standard and novel methods for the determination of surfactant content. 3. To explain the operating principles of surfactant sensors. 4. To distinguish surfactant chemical sensors and biosensors, based on principles of their action. 5. To select sensor suitable for analysis of a sample based on its composition. 6. To design home-made surfactant sensor for the targeted application.

Workshops

R-301
Jelena Macan
Electron microscopy
1. To systematise and orally present the literature survey on the techniques of electron microscopy. 2. To assess the suitability of techniques of electron microscopy for the specific analysis or specific sample. 3. To select the appropriate technique of electron microscopy and associated analytical detectors for sample characterization.

R-302
Jelena Macan
Thermal analysis methods
1. To systematise and orally present the literature survey on the thermal analysis methods. 2. To assess the suitability of of the method of thermal analysis for the specific analysis or specific sample. 3. To select the appropriate thermal analysis method for the characterization of the sample.

II. The regulatory execution requirements for the programme of study

Minimum legal and regulatory requirements:	YES/NO notes
1. The higher education institution (hereinafter: the HEI) shall be entered in the Register of Scientific Organisations in the scientific field of the doctoral programme of study and shall have a licence (obtained in accordance with the positive reaccreditation outcome) for performing scientific activity and higher education.	YES
2. The HEI shall have a vertical hierarchy of the programmes of study (including undergraduate and graduate university programmes of study) leading to the doctoral programme of study in the respective field and academic area or areas (in case of interdisciplinary programmes of study) and the required number of teachers as laid down under Article 6 of the Ordinance on the Content of a Licence and the Conditions for Issuing a Licence for Performing Higher Education Activity, Carrying out a Study Programme and Re-Accreditation of Higher Education Institutions (OG 24/2010).	YES
3. The HEI shall have a required number of employed scientists as laid down under Article 7 of the Ordinance on the Conditions for Issuing a Licence for Performing Scientific Activity, the Conditions for Re-Accreditation of Scientific Organisations and the Content of a Licence (OG 83/2010).	YES
4. The HEI shall execute more than 50% of the curriculum of the doctoral programme of study by its own teachers (fully employed and elected to academic ranks).	YES
5. The ratio between teachers and students in the entire HEI should be below 1:30.	YES
6. The HEI shall ensure public access to doctoral dissertations.	YES
7. The HEI shall ensure the procedure for revocation of the academic degree (PhD) in accordance with the Articles of Association or any other general act when it is detected that such degree was awarded in non-conformity with the regulatory requirements for its award, by grave violation of the rules of the programme of study or based on a plagiarised or falsified doctoral dissertation.	YES
Supplementary requirements of the Accreditation Council for issuing positive opinion	YES / NO notes
1. The HEI (or more HEIs) shall have minimum five teachers, involved in the execution of the doctoral programme of study, elected to academic ranks in **the academic area or areas** relevant for the execution of the programme of study.	YES
2. In the previous reaccreditation procedure the HEI's standard for Scientific and Professional Activity was evaluated, at the minimum, as "partially implemented" (3).	YES
3. The HEI's doctoral programme of study shall be in conformity with the strategic programme of scientific research.	YES
4. The ratio of mentors and doctoral students at the HEI shall not exceed 1:3.	YES
5. (All) HEI's mentors shall fulfil all the following requirements: a) are employed at research or academic positions that is associate positions (postdoctoral) with minimum two years of postdoctoral research experience; b) are active scientists in the scientific field of the doctoral programme of study (have published scientific papers, have participated in international scientific conferences and/or have participated in projects in the last five years (item 2); c) confirm feasibility of the framework research plan during enrolment of the doctoral student (or doctoral dissertation topic application); d) ensure the necessary requirements (including the financial support) for implementation of the scientific research of the doctoral student (in compliance with the framework research plan of the doctoral student) whether as the scientific project leaders, co-leaders or associates or in any other way; e) have taken part in any type of training (co-mentoring, workshops, etc.); f) have received positive opinion from the HEI about their mentoring work.	YES (largely)
6. The teachers shall fulfil all the following requirements: a) are employed at research or academic positions; b) are active scientists recognised in the academic area of the course they teach (item 1).	YES
7. As a rule, the mentor shall not take part as a member in the commission for doctoral dissertation topic evaluation, and doctoral dissertation evaluation and defence.	YES
8. The doctoral programme of study shall ensure minimum three years of individual/independent work on research (in parallel, individually, within or outside the instruction). The individual work on research shall imply writing a doctoral dissertation and scientific papers, participation in international conferences, field work, instruction carried out for the purpose of research, etc.	YES
9. In the event of joined and joint programmes of study and doctoral schools (at the university level), the HEI shall substantiate any cooperation with adequate agreements; the HEI shall execute the curriculum with the accredited HEI (for joined and joint doctoral programmes of study) that is the HEI shall execute the curriculum (in doctoral school) in a way fulfilling all the regulatory requirements and shall ensure good coordination and give support to doctoral students; the HEI's (and all other providers') own teachers shall cover minimum 80% of the instruction.	Not applicable

III. Self-evaluation in accordance with the quality assessment criteria

1. STAFFING, MENTORING AND RESEARCH CAPACITIES AND INFRASTRUCTURE

1.1. The higher education institution is an institution recognisable by its research/artistic achievements in the scientific/artistic discipline in which the doctoral programme of study is executed.

The scientific relevance of the Faculty is primarily indicated by the number of scientific and research projects carried out by the Faculty. By the end of 2013 there were 34 projects funded by the Ministry of Science, Education and Sports (hereinafter: MZOS, Croatian: *Ministarstvo znanosti, obrazovanja i sporta*), after which year, as a consequence of a decrease in financing at the national level and a modification in the financing method, the number of projects was reduced. That number considerably exceeds the national average nevertheless – the Faculty can list 14 projects in total approved by the Croatian Science Foundation (hereinafter: HRZZ, Croatian: *Hrvatska zaklada za znanost*), 9 of which projects are still active. The Faculty successfully obtains the funds, the so-called short-term research grants awarded by the University of Zagreb with 15 – 18 mini-projects approved annually from 2013 to 2016.
Of the active projects with an international component, the following should be singled out: 1 project from Horizon 2020 line, 1 research fellowship from Marie Sklodowska-Curie line, 2 projects from COST line, 6 active CEEPUS networks, and a large number of bilateral projects.
The Faculty is also a successful organiser or co-organiser of scientific conferences within the scope of its activity such as The 6th European Summer School on Electrochemical Engineering (ESEEE) in September 2012, POLYCHAR and Short Course on Polymer Characterization in March 2012 (an international conference under the auspices of the International Union of Pure and Applied Chemistry), a regular annual conference International Chromatography School, a biennial conference Meeting of Young Chemical Engineers (SMLKI, Croatian: *Susret mladih kemijskih inženjera*), a periodical conference International Symposium on Environmental Management (SEM), a biennial conference Implementation of Microreactor Technology in Biotechnology in cooperation with the Faculty of Chemistry and Chemical Technology, University of Ljubljana (an international conference under the auspices of the European Federation of Biotechnology, ESAB – European Section for Applied Biocatalysis) etc.
In the last five years (1 January 2012 – 31 December 2016) the Faculty employees published 432 and 467 papers cited in the WoS and Scopus databases, respectively, 2 books issued by a foreign publisher, 6 Croatian books, 79 papers in the category of national journals with international peer review according to the CROSBI database (partially overlapping with the Scopus database), 23 refereed book chapters, etc. In the same period, doctoral students published 212 doctoral dissertation related papers in the WoS database, another 94 doctoral dissertation unrelated papers cited in the WoS database that is 220 doctoral dissertation related papers cited in the Scopus database and 106 doctoral dissertation unrelated papers cited in the Scopus database. In the same five-year period, mentors in the previous doctoral programmes of studies published 634 and 668 papers cited in the WoS and Scopus databases, respectively.
The Manager of the Programme of Study Prof Marko Rogošić, PhD has published 39 papers in total cited in the WoS database, 10 of which papers were published in the last five years.
It is believed that the data provided are sufficient indicators for the institution's recognisability.

1.2. The number and workload of teachers involved in the doctoral programme of study ensure doctoral education of good quality.

There are 66 teachers currently participating in the execution of the doctoral programme of study, 15 of whom are external associates. The external associates are only exceptionally independent course providers. In other words, it is possible to deduce that the Faculty executes more than 50% of the curriculum of the doctoral programme of study by its own teachers (fully employed and elected to academic ranks). In the academic year 2016/2017 the teaching workload index of teachers in the entire institution amounts to 1.39, which workload also includes the instruction in doctoral programmes of study. Therefore, it is also possible to conclude that teachers are not considerably overloaded and are thus able to provide good quality teaching in the doctoral programme of study.

1.3. The teachers are highly qualified scientists for the courses they hold and are committed to, and consequently ensure good quality of the doctoral programme of study.

All teachers in the doctoral programme of study are affirmed scientists, elected to relevant research and academic ranks. When developing the doctoral programme of study, it was taken into account that the courses offered should correspond with the scientific portfolio of the teacher. In cases in which it was impossible to provide a competent teacher for a specific field within the institution, external associates were selected, 15 in total, 6 of whom come from foreign countries. The doctoral students who, due to the field of their scholarly interest, wish to enrol in a course at another programme of study at the University of Zagreb are able to do so, based on their application submitted in writing. It is also possible to do *vice-versa*: the doctoral students from other components of the University of Zagreb are allowed to enrol in courses in the programme of study Chemical Engineering and Applied Chemistry.

1.4. The number and qualifications of mentors ensure proper development of a doctoral dissertation.

The first doctoral dissertation topics in the programme of study Chemical Engineering and Applied Chemistry have only recently been approved, and the mentors appointed were selected from the ranks of teachers involved in the programme of study. For this reason, it is better to provide an account of practice typical for the former programmes of study Chemical Engineering and Engineering Chemistry. From 1 January 2012 to 31 December 2016 86 doctoral dissertations were defended, with the total of 77 different mentors, 34 of whom participated in dual mentoring. There were 8 mentors from the ranks of teachers in the previous programmes of study who were outside the Faculty, 25 mentors were appointed from the ranks of scientists outside the Faculty who were not teachers in the programme of study, and there were also 4 foreign nationals involved. The total mentor/doctoral student ratio amounted to 97:145 = 0.67, which is twice as high as the critical ratio of 1:3. All cases involved acclaimed active scientists, scientific and research project leaders, and teachers from the University of Zagreb, other universities and scientific institutions in Croatia, foreign universities or Croatian and foreign companies, the activity of which companies also includes a scientific component. The scientific activity of mentors was verified by inspecting their scientific references, the link with the doctoral dissertation topic that is with the candidates themselves, who very commonly came from the same institution as their mentor. In the application form for the doctoral dissertation topic (Dr.Sc.01), there were five relevant papers published in the last five years listed for every nominated mentor. The mentors' performance was evaluated by the candidates themselves using the standard form Dr.Sc.04 of the University of Zagreb.[2] No negative evaluations or deviations were recorded in the statistics of the degree awarding rate that would justify negative evaluation of a specific mentor. For any seldom case of problems recognised by the candidates concerning their progress in the process of developing their doctoral dissertations, the candidates blamed themselves. For training of new mentors, the Faculty used the workshops organised at the Faculty, attended by merely one attendant, a young assistant professor (28 – 29 March 2011). There was another attendant selected for the training, but meanwhile the workshops were phased out. There were 2 candidates who were able to use the institution of dual mentoring and to acquire their first experiences in this type of mentoring.

1.5. The higher education institution has developed the methods of verifying the qualifications of teachers and mentors.

The initial quality of the doctoral programme of study Chemical Engineering and Applied Chemistry, including its teachers, was verified by the University of Zagreb (hereinafter: the University), which evaluated positively the prepared Report about Periodical Internal Evaluation of Doctoral Programmes of Study. The report and its evaluation were also submitted to the Agency for Science and Higher Education (AZVO, Croatian: *Agencija za znanost i visoko obrazovanje*) and to the Ministry of Science, Education and Sports (MZOS). After supplementary verifications, the two institutions approved the entry of the programme into the Register of Programmes of Study. The quality and scientific excellence of mentors and teachers employed by the Faculty are also regularly verified otherwise, irrespective of the doctoral programme of study, using the promotion system that is election to research and academic ranks. For this procedure, the national criteria are applied for teachers in the field of natural sciences. For teachers in the field of technical sciences the internal criteria are applied, which exceed the national criteria multiple times, see Recommendations of the Faculty of Chemical Engineering and Technology for the Election to Academic, Research, Teaching and Associate Ranks.[3] The regular accreditation cycle of the AZVO is also used to evaluate teachers and mentors, see e.g. documents concerning the Self-Evaluation Report of the Faculty of Chemical Engineering and Technology 2008/2009[4] and the Self-Evaluation Report of the Faculty of Chemical Engineering and Technology 2014/2015.[5] The so-called Annual Self-Evaluation Report of the Faculty is an additional verification mechanism introduced recently, see e.g. the document Annual Self-Evaluation Report of the Faculty of Chemical Engineering and Technology 2016/2017.[6] The verification mechanisms for the qualifications of mentors include the above-mentioned annual progress report provided by doctoral students Dr.Sc.04,[2] and the Annual Performance Report about the Programme of Study Dr.Sc.09.[7] All the documents are adopted by the Faculty Council in its sessions.

1.6. The higher education institution has adequate research resources available in compliance with the requirements of the scientific/artistic discipline in which the doctoral programme of study is executed.

Throughout time and in accordance with available funds, the Faculty has purchased state-of-the-art equipment and has furnished its laboratories in line with the requirements for the contemporary scientific and research work, as supported by a somewhat older document entitled Equipment Catalogue 2007.[8] Due to the economic crisis, the level of funding for the Faculty has been gradually reduced since 2008. As a result, in the context of major equipment, only two instruments were purchased, XRD Shimadzu 6000 X-ray diffractometer and Tescan Vega III Easyprobe scanning electron microscope. The Faculty has also applied for the Eighth Public Call for Submitting Project Proposals for Preparation of Infrastructure Projects Pipeline for the European Regional Development Fund 2014 – 2020. The Faculty of Mining, Geology and Engineering of the University of Zagreb, as a project holder, prepared and submitted the application "Virtulab Project – an Integrated Laboratory for Primary and Secondary Raw Materials" on 22 December 2015. The project is accepted and included in the indicative list and also foresees procurement of new equipment for the Faculty. A widespread network of external teachers in the doctoral programme of study, that is external mentors, the exchange networks in the framework of the programmes: CEEPUS, Erasmus+, Erasmus Mundus, scientific projects of the HRZZ, the project from Horizon 2020 line, and bilateral projects help extend the infrastructure base available for scientific and research work.

The Library and Information Centre (BIC, Croatian: *Bibliotečno-informacijski centar*) is an organisational unit of the Faculty which has a considerable fund of scientific books and handbooks and older periodicals. The more recent periodicals are largely available online and purchased on the basis of contracts at the national level. Scarce funding led to termination of previous procurement contracts for 2015, which situation the University attempted to bridge partially by direct contract with one of the representatives. In 2016 and 2017 the earlier levels of funding are returned, which implies satisfactory coverage of the programme of study with more recent periodicals. Using its own funds, the Faculty purchases merely three Croatian and four foreign periodicals over the BIC. The BIC compensates for the funding gaps and very successfully uses interlibrary exchange or loan.

2. INTERNAL QUALITY ASSURANCE SYSTEM FOR THE PROGRAMME OF STUDY

2.1. The higher education institution has determined and adopted efficient procedures whereby doctoral education is proposed, approved and implemented. The procedures include explanations for scientific/artistic, cultural, social and economic needs.

The Faculty is a component of the University of Zagreb and fully adopts the University's regulations concerning initiation of new programmes of study, including doctoral programmes of study. In this regard, the fundamental document is the Ordinance on Evaluation Procedure for Doctoral Programmes of Study of the University of Zagreb of 2011[9] as well as the Ordinance on Amendments to the Ordinance on Evaluation Procedure for Doctoral Programmes of Study of the University of Zagreb of 2013,[10] and the Ordinance on Amendments to the Ordinance on Evaluation Procedure for Doctoral Programmes of Study of the University of Zagreb of 2016.[11] The Faculty has adopted the principle of integrating and consolidating doctoral programmes of study which may eventually lead to the establishment of the University Doctoral School. Therefore, the Faculty has no intention to initiate new doctoral programmes of study in the near future.

The Ordinance on Evaluation Procedure for Doctoral Programmes of Study of the University of Zagreb of 2011 provides for the development of the Programme of Study Report, which shall, in its introduction, include the rationale for initiating the proposed doctoral programme of study. A special account should be given concerning justification for initiating the new doctoral programme of study given the existence of similar doctoral programmes of study at the University of Zagreb, the purpose of the proposed doctoral programme of study given the needs in research activities in the public and private sector, and the employment potential, as well as the purpose of the proposed doctoral programme of study in the context of fostering social and economic development. The Faculty has developed the respective Report about the Doctoral Programme of Study Chemical Engineering and Applied Chemistry in the format designed for such purpose by the University. Based on the Report submitted, the University adopted positive evaluation of the programme of study, which evaluation was submitted to the AZVO. The additional verification carried out by the AZVO also included development of the Study on Justification for the Execution of the Proposed Programme of Study, which Study contained the explanations concerning the needs in the labour market, interest in the academic area of the programme of study at the level of the Republic of Croatia, interest in the academic area of the programme of study at the regional level, vacancy in the institution in the summer enrolment period, comparability with the existing programmes of study, compliance with the economic, social and societal and cultural priorities of the Republic of Croatia, and compliance with the national and county development strategy. Based on the above-mentioned, the AZVO adopted a positive decision concerning the compliance of the programme of study with the strategic document the Network of Higher Education Institutions. In accordance with the AZVO's decision, the MZOS approved the entry of the programme of study into the Register of the Programmes of Study.

2.2. The initiation of the doctoral programme of study is in compliance with the scientific mission and vision of the higher education institution and the strategic programme of scientific/artistic research of the higher education institution.

In line with the Development Strategy of the Faculty of Chemical Engineering and Technology of the University of Zagreb for 2015–2020 Period[12] adopted on 24 February 2015, the mission of the Faculty is:

To promote chemical engineering and applied chemistry as scientific disciplines by establishing links between science and technology and economy, industry and public activities, with the aim of achieving sustainable development, increasing the general level of innovation in the society, accelerating knowledge transfer that is creating and promoting new entrepreneurship.

The name of the doctoral programme of study is explicitly mentioned in the first couple of words of the mission statement and therefore there is no need to enter into any further discussions concerning its compliance.

The vision of the Faculty reads as follows:

The vision of the Faculty of Chemical Engineering and Technology is to become recognised in the Central European region as a venue of "good vibrations", a focal point of partnership- and cooperation-based gathering at the international, national and local level, in the projects developing innovative and improving current chemical processes, products and materials as well as in the environmental protection projects. The students who complete their undergraduate, graduate and postgraduate programmes of study at the Faculty will be sought as excellent and broadly educated human resources competent in finding efficient problem solutions within their scope of activity. The public at large will recognise the Faculty as an institution showing corporate social responsibility within the scope of its scientific, educational and professional activity.

The compliance is here "concealed" behind the discussion about projects. More specifically, the areas of the outlined projects correspond with the topics of approved or defended doctoral dissertations that is with the Faculty's scope of scientific activity.
The mission and the vision are repeated by the Faculty in another strategic document extracted from the General Development Strategy, the Strategic Programme of Scientific Research of the Faculty of Chemical Engineering and Technology of the University of Zagreb for 2015–2020 Period[13] adopted on 24 February 2015 as well that is in its more recent version adopted on 29 February 2016. The Strategic Programme indicates the following directions of scientific research:
Investigations in the (future) Department of Applied Chemistry (ZPK, Croatian: *Zavod za primijenjenju kemiju*):

- Analytics of the environment oriented toward the development of advanced analytical methods for monitoring priority and emerging pollutants in the environment
- Chemometrics in analytical chemistry
- Organic synthesis oriented toward medical and pharmaceutical applications
- Organic photochemistry oriented toward monitoring of mechanisms of reactions in excited state as well as toward identification of photoproducts in laboratory and in environment
- Development of advanced chemical and biochemical sensors

Investigations in the (future) Department of Chemical Process Engineering (ZKPI, *Croatian: Zavod za kemijsko procesno inženjerstvo*):

- Methods of intensifications of modern separation – distillation, absorption, adsorption, extraction and electrocoagulation – processes
- Desulphurisation, denitrification and dearomatisation of oil and oil fractions
- Catalysts and catalytic processes – methods of intensification and applications in petroleum, petrochemical and pharmaceutical industry as well as in purification of water and air
- Development of advanced methods of industrial process control
- Comminution and agglomeration processes with applications in pharmaceutical and other industries
- Development of polymeric additives for advanced applications

Investigations in the (future) Department of Materials Engineering (ZIM, *Croatian: Zavod za inženjerstvo materijala*):

- Surface phenomena in multiphase polymeric materials
- Bioactive and biodegradable polymeric materials
- Nanostructured organic / inorganic composite materials with potential medical applications
- Nanostructured advanced ceramic materials
- Advanced materials for applications in storage of energy
- Advanced methods of corrosion protection

Investigations in the (future) Department of Environmental Engineering (ZE, Croatian: *Zavod za ekoinženjerstvo*):

- Advanced oxidation processes in water treatment
- Processes for treatment of waste effluents and bioremediation of the environment
- Removal of inorganic and organic pollutants from potable water
- Membrane separation processes
- Industrial biotechnology
- Application of micro- and macroreactors in biochemical engineering.

By careful comparison between the directions outlined and the titles of approved or defended doctoral dissertations, it is possible to identify full compliance. In fact, within their courses, the teachers in the doctoral programme of study share the results of their recent investigations. In the event that the scientific interest of the candidate fails to fully correspond with the scientific interest of the mentor from the ranks of teachers in the doctoral programme of study, that is where a marginal or an interdisciplinary field is concerned, as a rule dual mentoring is arranged and the most suitable and available mentor is assigned to each and every candidate in particular.

2.3. The HEI periodically monitors the performance of the programme of study by evaluating the doctoral programme of study and works on its improvements.

Many answers for the listed items are repetitive. Therefore, it is once again repeated: the periodical evaluation of higher education institutions also includes the academic area of doctoral programmes of study, see e.g. the Self-Evaluation Report of the Faculty of Chemical Engineering and Technology 2008/2009[4] that is the Self-Evaluation Report of the Faculty of Chemical Engineering and Technology 2014/2015.[5] The periodical evaluation of all doctoral programmes of study, including the one under consideration herein, is carried out by the AZVO as well, see e.g. the document Report about Thematic Evaluation of Doctoral Programmes of Study in the Republic of Croatia.[14] In the framework of periodical evaluation of the doctoral programme of study, the initial quality of the doctoral programme of study Chemical Engineering and Applied Chemistry is also carried out by the University, in the format of the Report

about Periodical Internal Evaluation of Doctoral Programmes of Study. The Faculty itself conducts periodical evaluation as well, within the Annual Self-Evaluation Report of the Faculty of Chemical Engineering and Technology for 2015 and 2016, respectively[6], but also in the documents regulated under the Ordinance on Doctoral Programmes of Study at the University of Zagreb,[15] such as the annual documents in the formats: Dr.Sc.04,[2] wherein the doctoral students evaluate both themselves and their mentors, Dr.Sc.05[16] wherein the mentors evaluate the progress of doctoral students and the Annual Performance Report about the Doctoral Programme of Study Dr.Sc.09,[7] adopted by the Faculty Council and submitted to the University. A majority of the documents listed monitor and evaluate the scientific productivity of both mentors and doctoral students as well. The feedback received from doctoral students about their mentors was very positive, and to date there has been no need to make any interventions. The feedback received from employers has not been systematically collected until now, but merely periodically, e.g. in the surveys entitled "Does the programme of study Chemical Engineering meet the employment needs?" carried out in 2003 and 2008 in cooperation with the Croatian Society of Chemical Engineers (HDKI, *Croatian: Hrvatsko društvo kemijskih inženjera i tehnologa*) in response to the call from the World Chemical Engineering Council (WCEC). The findings showed good correspondence with the findings obtained by the WCEC. The persons who attained the PhD degree outside the system of science and higher education largely remain on their previous jobs, a portion of doctoral students within the system of science and higher education remain in the system, at their home Faculty and other higher education institutions, the statistics of which is maintained by the Faculty. Some doctoral students start working for companies, mostly in the area of pharmaceutical industry, which is recognised as excellent feedback received from employers. A mention should also be made here of an imprudent move of the state administration, which at one point in time subsidised enrolment of the candidates from industry using tax relieves. The companies exploited the opportunity and encouraged enrolment of their employees, without any real intention to support them while studying. Such candidates only seldom managed to complete their programme of study. Based on this observation, the entry interviews with the candidates are approached with caution. The candidates coming from industry have an obligation to submit proof of payment for the programme of study (a written receipt) prior to enrolment, but during the interview, the information is sought concerning real support, both moral and financial, from their home institution or from any other institution for the experimental part of their doctoral dissertation.

2.4. The HEI systematically monitors the mentors' performance, has the established mechanism for evaluation and replacement of mentors, as well as for resolving any potential issues arising between mentors and doctoral students.

In this context, it is important to mention the annual document Dr.Sc.04,[2] wherein doctoral students evaluate both themselves and their mentors, and the Annual Performance Report about the Doctoral Programme of Study Dr.Sc.09,[7] which is *inter alia* a compilation of the data collected. The Self-Evaluation Report of the Faculty of Chemical Engineering and Technology 2008/2009,[4] the Self-Evaluation Report of the Faculty of Chemical Engineering and Technology 2014/2015,[5] and the Annual Self-Evaluation Report of the Faculty of Chemical Engineering and Technology 2015/2016[6] contain the data concerning mentoring quality indicated in the analysis of the scientific performance of doctoral students (especially in the analysis of publications). The Faculty and the University systematically collect and file the data about completed doctoral programmes of study, and recently the system of public access to doctoral dissertations has been introduced (the Repository of Doctoral Dissertations) in case there are no impediments encountered to the protection of intellectual property or data confidentiality. The Ordinance on Doctoral Programmes of Study at the University of Zagreb,[15] observed by the Faculty as well, includes a form Dr.Sc.06[17] – Request for Change of the Topic and/or Mentor and the provisions whereby any potential issues arising between mentors and doctoral students are sought to be resolved. In terms of remuneration for successful mentors, the Faculty believes that the system of promotion and election to academic ranks is a sufficient impetus for mentors to get involved in the mentoring activity. More specifically, the Decision on the Requirements Needed for Evaluation of Academic and Professional Activity in the Procedure of Election to Academic Ranks (the so-called Criteria of the Rectors' Conference)[18] also includes the evaluation of the teachers' mentoring work.

2.5. The HEI ensures academic honesty and freedom of scientific research.

The recent document Ordinance on Amendments to the Ordinance on Doctoral Programmes of Study at the University of Zagreb[11] legally regulates the procedure in the event of doctoral dissertation plagiarism. In terms of other ethical elements, rare cases have been detected in which the Faculty requested the opinion from the Ethical Council of the University of Zagreb in some disputable situations, that is the opinion from the competent Ethical Commission of the School of Medicine of the University of Zagreb when the scientific investigations within the doctoral programme of study involved experiments on human tissue.

2.6. The procedure for development and defence of the doctoral dissertation topic is clear and objective and includes public presentation of the topic of PhD research.

This area is fully regulated under the Ordinance on Doctoral Programmes of Study at the University of Zagreb.[15] The form Dr.Sc.01[19] is used as an application form for the doctoral dissertation topic and is filled out online, in the University databases called OBAD. The Faculty Council appoints the Commission for Doctoral Dissertation Topic Evaluation. The protocol and the minutes of defence of the doctoral dissertation topic are regulated.[20] The defence is public and announced in line with regulations on the Faculty's notice boards and website. The candidate is allowed to use the official template of the Faculty to make a Power Point presentation.[21] The form Dr.Sc.02[22] contains the evaluation of the topic provided by the appointed Commission. The Commission's Report is adopted by the Faculty Council, and followed by a form Dr.Sc.03 prepared by the Students' Administration Office, the so-called Decision on the Approval of the Doctoral Dissertation Topic.[23] The forms: Dr.Sc.01 – Dr.Sc.03 are submitted to the University, the Office for Doctoral Programmes of Study and Curricula, which Office forwards the topic to the University Commission for Doctoral Dissertations, and then to the relevant Scientific Field Council (the Council for Natural Sciences, the Council for Technical Sciences). After approvals at all verification levels, the topic is approved by the University Senate. All the relevant documentation is made public and available on the Faculty's and the University's websites.

2.7. The evaluation of doctoral dissertation is a result of scientific assessment provided by an independent commission.

This area is also fully regulated under the Ordinance on Doctoral Programmes of Study at the University of Zagreb.[15] It is mandatory that every Doctoral Dissertation Evaluation Commission includes a member who is not employed by the Faculty, but who comes from another component of the University, from other Croatian or foreign Universities or institutes. The number of foreign members in the Doctoral Dissertation Evaluation Commission amounted to 6 in the selected five years (from 1 January 2011 to 31 December 2015). The number would have been even larger if the entire financial situation had been better. The Ordinance on Doctoral Programmes of Study at the University of Zagreb[15] regulates that doctoral students shall have minimum one internationally refereed scientific paper published or approved for publication prior to doctoral dissertation defence, which paper is thematically relevant for their PhD research. The Decision of the Faculty Council[24] includes a supplementary, more rigorous requirement according to which the paper shall be published in a journal cited in the tertiary database of Web of Science (WoS), except in the journals CABEQ (Chemical and Biochemical Engineering Quarterly) and *Kemija u industriji*. The first of two excluded journals is the official journal of the Faculty and the second one is edited by a member of the Faculty staff. They are excluded in order to avoid any potential conflict of interest. Accordingly, every doctoral dissertation has one independent foreign verification at the minimum prior to defence, and many doctoral dissertations have a number of such verifications. The verifications continue after defence as well, when the results are published elsewhere. It is possible to match doctoral dissertations defended in the period from 1 January 2011 to 31 December 2015 with 212 papers in total in the database of WoS that is 220 papers in the database of Scopus in the same period of time. This accounts for 2.56 papers per doctoral dissertation, and the total number is even larger as the papers published by doctoral students in the period either before or after the indicated period were not taken into account. In terms of the format of doctoral dissertation, the Ordinance on Doctoral Programmes of Study at the University of Zagreb[15] allows a format of scientific monograph and the Scandinavian doctoral dissertation model in the field of natural sciences and technical sciences relevant for the doctoral programme of study under consideration. A vast majority of students opt for the scientific monograph. Nevertheless, there were also examples of doctoral dissertations submitted in accordance with the Scandinavian model and the examples of doctoral dissertations the format of which was in between the two models. The University regulated the form Dr.Sc.08[25] for layout guidelines regarding doctoral dissertation development, the form Dr.Sc.10[26] for the Report on Doctoral Dissertation Evaluation and the form Dr.Sc.11[27] for the protocol and the minutes of the doctoral dissertation defence.

2.8. The HEI publishes any required information about the programme of study, its enrolment requirements, execution and the requirements for progress in and completion of the programme of study in easily accessible locations and media.

The Faculty integrates the most important information about the programme of study on its website, in a special directory[28] which concerns the doctoral programme of study under consideration. In addition, the call for enrolment is published every year simultaneously in the public media and on the homepage of the Faculty's website.[29] At the same time, the Students' Administration Office diligently responds to any possible enquiries of potential enrolment candidates for and students of the doctoral programme of study.

2.9. The funds raised for the needs of doctoral education are allocated in a clear way, ensuring sustainability and improvement of doctoral education (ensuring the execution and support to investigations carried out by doctoral students to help them complete their programme of study successfully).

The Decision[30] on Determination of Tuition Fees and Costs of Studying in the Doctoral Programmes of Study at the Faculty is prepared by the Council of the Doctoral Programme of Study, and adopted by the Faculty Council for every academic year. The Faculty's Map of Business Processes defines the method of allocation of funds raised within the Tuition Fees Fund for the Doctoral Programme of Study Chemical Engineering and Applied Chemistry. 2% of tuition fees are allocated to the University Fund in compliance with the Ordinance on Funding Bases of the University of Zagreb.[31] 38% of funds are allocated to the Fund for Improvement of the Faculty's Activities, used to finance the procurement of equipment, books and journals, publication of calls, training of employees, capital investments and investment maintenance. Any above-mentioned costs can be easily linked with ensuring maintenance and improvement of doctoral education by enhancing the general level of the institution, especially because the students of the doctoral programme of study are largely also employed by the Faculty. 60% of tuition fees are allocated to the Faculty's Fund, used to finance project reviews, grants for employees, students' programmes, etc. The elements of financing doctoral education also include the fact that the MZOS, according to the regulations in force, requires from the Faculty to enrol all teaching assistants into the doctoral programme of study. However, at the same time the MZOS fails to provide the funds for their tuition fees, which in fact implies that the Faculty pays doctoral education of its employees from its own funds. The doctoral students recruited for the projects of the HRZZ or within other Croatian or international competitive projects pay for their tuition fees for the doctoral programme of study. Nevertheless, it should be said that they are formally employees of the Faculty and are subject to the University Decision[32] whereby the employees are charged only 50% of the price of the doctoral programme of study. The same is also valid for teaching assistants employed by other components of the University. This equally implies that the difference in full price is also covered by the Faculty itself. In respect of the structure of enrolled students in the first two generations of the programme of study under consideration, the funds raised by the Faculty from tuition fees are very small. The Faculty may also document other types of costs regarding the doctoral programme of study. The costs of external commission members are covered in accordance with the Decision on Co-Financing of the Costs of External Commission Members.[33] The Faculty organises and covers the costs of doctoral students for the workshops enabling them to acquire generic skills ("How to give effective oral presentation of your research?", "How to publish your paper in a research journal?" in cooperation with the Association for Promotion of Multimedia Education (UMNA, Croatian: *Udruga za promicanje multimedijske nastave*)). The Faculty purchases the software required for research (Wolfram Mathematica, Talete Dragon, etc.). The Faculty does not pay the fee for the instruction carried out in the framework of the doctoral programme of study to its employees or to external associates, nor does it remunerate mentoring. A part of direct research costs, such as procurement and maintenance of major and minor scientific and research equipment is co-financed from the Faculty's Fund that is from tuition fees. The other part of research costs, especially of the doctoral students employed by the Faculty, such as laboratory and office supplies, laboratory instruments, travelling costs, conference participation fees, dissemination costs, etc. are covered from the scientific and research projects and the professional activity of the Faculty. In so doing, the Faculty is fairly successful in the scientific and research segment at the national level, whereas in the professional activity it lags behind the most successful higher education institutions in Croatia. In this respect, the Faculty strongly supports the application of new projects by its scientists and teachers for all project lines and encourages them to apply their projects for the funds allocated by the University within the call for short-term research grants (in which context the Faculty was among the most successful components of the University in the previous period), the call for academic mobility (e.g. conference participation fees for doctoral students, etc.). The research funds are similarly also provided by doctoral students who come from other scientific and educational or scientific institutions in Croatia. The doctoral students coming from companies pose the biggest problem as their companies sometimes fail to give them support for their studying. A few doctoral students from foreign countries are also problematic as they mostly come from poor countries in the Eastern neighbourhood. The effort is then made to engage them informally in scientific and research projects at the Faculty.

2.10. The tuition fee and costs are determined in accordance with clear criteria (and real costs of the programme of study).

As indicated under the previous item above, the Decision[30] on Determination of Tuition Fees and Costs of Studying in Doctoral Programmes of Study at the Faculty is prepared by the Council of the Doctoral Programme of Study, and adopted by the Faculty Council for every academic year. The previous item lists the details concerning the allocation of those funds – the tuition fee covers merely a small portion of real costs concerning doctoral dissertation development. The costs of work on the experimental part of doctoral dissertation are difficult to estimate, as they differ considerably on the case by case basis. They are partially – especially for doctoral students employed by the Faculty – covered indirectly from the Fund for Improvement of the Faculty's Activities that is from the Faculty's Fund. In comparison with tuition fees of other doctoral programmes of study at the University of Zagreb, the tuition fee of the doctoral programme of study is considered to be moderate and adequate for the current financial situation in the country.

3. SUPPORT GIVEN TO DOCTORAL STUDENTS AND THE PROGRESS ACHIEVED IN THE PROGRAMME OF STUDY

3.1. The HEI determines the enrolment quotas in accordance with its teaching and mentoring capacities.

The execution of the doctoral programme of study currently involves 66 teachers, 15 of whom are external associates. All of them are potential mentors, and based on positive experiences to date, the Faculty and the candidates also count on participation of mentors from other scientific and scientific and educational institutions which cannot organise and execute a programme of study in the field under consideration on their own. The number of potential mentors can thus be estimated to be 100 in total. The Report about Periodical Internal Evaluation of Doctoral Programmes of Study foresees the enrolment of maximum 40 candidates annually. If the average duration of studying is conservatively estimated to take 5 years, it means that maximum 200 candidates can be taken into account that is 2 candidates per a potential mentor. From the current point of view, it seems that the Faculty can objectively count on maximum 20 candidates a year, which means that its teaching and mentoring capacities are fairly sufficient for proper execution of the programme of study.

The Faculty systematically monitors the teaching workload of its employees participating in the execution of instruction, which workload also includes the workload concerning doctoral programmes of study. The mentoring workload is not taken into account as the previous Collective Agreement for Science and Higher Education[34] failed to provide for such possibility. However, the said Collective Agreement was terminated, and the new Agreement has not been concluded, and practically there are no relevant regulations in force.

The Faculty takes care of the competences of its teachers. There were cases registered in which the candidate had been advised to withdraw from enrolment as the Faculty had not been able to provide an adequate mentor.

The obligations of mentors and doctoral students are laid down under the Ordinance on Doctoral Programmes of Study at the University of Zagreb.[15]

3.2. The HEI determines enrolment quotas according to scientific/artistic, cultural, social, economic and other needs.

The Faculty uses surveys to communicate with its alumni on regular bases, especially with fresh graduates, and follows their career development.[35] Based on such surveys, it was recognised that about 15% of graduates who completed graduate programmes of study opt for continuation of education in postgraduate programmes of study. In the context of students from the Faculty, it indicates that the Faculty can count on 15 – 20 such interested students from its own ranks annually. When there is a lack of available jobs or projects that would finance their employment in Croatia, as the case was at the height of the recent economic crisis, the students make a decision to continue their studies in foreign countries.

Under the previous item, it was specified that the Report about Periodical Internal Evaluation of Doctoral Programmes of Study foresees the enrolment of maximum 40 candidates a year, whereas the experiences of the first two years of the programme of study and the survey findings show that the Faculty may objectively count on maximum 20 "own" candidates a year and a specific number of candidates who graduated elsewhere.

Furthermore, the AZVO verified the compliance with the needs of the society to a large extent and quite recently, during initial accreditation, in the format of the document Study on Justification for the Execution of the Proposed Programme of Study (Compliance with the Network of Higher Education Institutions).

The relevant items specified under the above-mentioned document are repeated below:

- Compliance with economic, social and societal and cultural needs of the Republic of Croatia
  The need to reindustrialise the Republic of Croatia has been increasingly underlined recently, and the main economic topics in the media *inter alia* include disputes between the Republic of Croatia and MOL over INA – Industrija nafte d.d. ownership, exploration of gas and petroleum deposits in the Adriatic Sea Basin, and finding of the strategic partner for Petrokemija Kutina d.d. It seems that the programme of study under consideration may contribute to strengthening of the position of the Republic of Croatia in any of the foregoing cases. A great number of candidates will come from the pharmaceutical industry, as perhaps the most propulsive industrial branch of Croatian economy.
  A considerable number of topics are also expected in the area of new materials and environmental protection, all corresponding with the priorities of the Republic of Croatia.
- Compliance with the National and County Development Strategy
  In the area of higher education, the Strategy of Education, Science and Technology 2013[36] *inter alia* specifies the following strategic objectives: 2.2 To establish distinction between university and professional programmes of study solely according to transparently verified competences (it is necessary to increase the

attractiveness and competitiveness of the programme of study, especially in the areas of concern for the development of economy, STEM (Science, Technology, Engineering, Mathematics)); 2.8 To redefine the model of studying with partial workload (programmes in the STEM area will be fostered (by stimulating higher enrolment quotas, Programme Agreements, etc.) which will prepare the experts able to respond to the requirements of the contemporary economy and the public sector). These two examples most clearly show compliance with the national development strategy, but all other objectives are also implicitly introduced into the programme under consideration through the quality system policy of the Faculty, the Strategy of the Faculty of Chemical Engineering and Technology[12] and other documents.

- In the document Zagrebplan, Development Strategy of the City of Zagreb, Plans and Priorities until 2020,[37] in section 10.1.4. the following is indicated: "Given the demographic trends… the number of postgraduate students will be increased…" and "The University of Zagreb will… have a central role in postgraduate and doctoral programmes of study and will be a breeding ground… of other highly qualified human resources." This strategy does not tackle higher education in too many details that is in the context of scientific, educational and professional work, higher education institutions are largely granted autonomy.

Given a small number of defended doctoral dissertations a year (not exceeding 25 in best years), the Faculty is able to keep track of the careers of all its doctors of science, at least in the first period after the PhD degree has been awarded to doctoral students. The cases of long-term unemployment are extremely rare and a result – according to the Faculty's estimates – of overestimating one's own knowledge output and overly high expectations. The biggest problem right now is the employment of junior researchers at the Faculty who are leaving the system. The Faculty was very successful in applying scientific projects (the so-called Z-projects) to the MZOS. It had a large number of doctoral candidates and was not able to recruit them into the ranks of its own teachers or expert associates. Only the best have been recruited, selected in the transparent evaluation procedure according to the document the Scoring System for Applicants Elected to the Academic Rank of Assistant Professor.[38] The others were mostly absorbed by other higher education institutions, such as the Faculty of Mechanical Engineering and Naval Architecture of the University of Zagreb, the Faculty of Geotechnical Engineering in Varaždin of the University of Zagreb, the Faculty of Metallurgy in Sisak of the University of Zagreb or the Karlovac University of Applied Sciences, that is by industry, e.g. by companies such as Pliva Hrvatska d.o.o. or INA – Industrija nafte d.d. It seems that for the last two years the Pliva Company has made a decision to recruit applicants who are doctors of science as the most productive way of enhancing the educational level of its own employees. As indicated under item 2.3, the state administration at one point in time subsidised the enrolment of candidates from industry using tax relieves. The companies exploited the opportunity to encourage enrolment of their employees, without any system of support and such candidates only exceptionally managed to complete their programmes of study. This was also valid for rare cases when the Faculty and the company had a joint project, and doctoral students were the employees of the company. Successful doctoral candidates largely remained in the companies that had sent them to study, as well as the doctoral students who had been sent to study by other higher education institutions.

The self-paying candidates were very rare, and after completing their PhD programme of study, they would remain working on their previous jobs. An example of a person with the awarded PhD degree who set up a company was also registered. The Faculty established the company Comprehensive Water Technology d.o.o. (CWT) as the first university spin-off company in Croatia, employing one of its doctoral students.

The real challenge is expected in the near future, as the new legal solutions will accelerate the turnover of teaching assistants of the MZOS and doctoral students of the HRZZ, who will remain in the system for six that is four years and afterwards try to find a job in the labour market. As the Faculty hopes to remain relatively successful as it is today in competitive national projects (HRZZ), and more successful at the international level (Horizon 2020), a continuous outflow of highly educated human resources will be created, and it is yet to be seen how this will be accepted by Croatian and foreign employers.

3.3. The higher education institution determines the enrolment quotas in accordance with financing available for doctoral students that is in line with the absorption potential of scientific and research projects or other sources of financing.

This item is a follow-up of the previous item. As above-mentioned, the experiences of the first two years show that it cannot be expected that the enrolment quota of 40 candidates will be fulfilled. Furthermore, since the calls for enrolment do not correspond with the calls for projects in terms of dates, the Faculty as a rule first employs the applicants for the position of teaching assistant or for scientific and research projects, and then enrols them in the doctoral programme of study. The teaching assistants of the Faculty who are not related with any project encounter a practical problem connected with financing of investigations. The Faculty uses its internal reserves, for instance resulting from cooperation with industry, and very small funds provided by the MZOS allocated to all public universities in accordance with Programme Agreements, and distributed by the University of Zagreb to the components of the University in the format of the so-called short-term research grants. The projects abundantly (co)-

financed by industry are very rare, but the Faculty keeps track of the calls for projects in this area as well. The candidates coming from industry have an obligation to submit proof of payment for the programme of study (a written receipt) prior to enrolment, but the Faculty also makes an effort during the entry interview to detect whether they have real support, both moral and financial, from their home institution or from any other institution for the experimental part of their doctoral dissertation.

3.4. When selecting the candidates for enrolment and determining their number, the higher education institution takes care to assign a programme of study counsellor (a potential mentor) to every candidate enrolled. After admittance, the HEI takes care of every candidate regarding the sustainable research plan and successful completion of the doctoral dissertation.

There are several categories of students. Teaching assistants from the Faculty, teaching assistants from other components of the University, from other universities and scientific organisations and doctoral students from projects of the HRZZ or from European projects are not at risk. More specifically, even without being formally assigned a programme of study counsellor, at the moment of their admittance they already have their topic approximately defined and an internally developed research plan as they have been employed by the scientific or scientific and educational organisation for a while and have been actively engaged in research. The doctoral dissertation topic application procedure which commences when the form Dr.Sc.01[19] has been filled out, used as an application form for the doctoral dissertation topic, only makes the current status formal. The doctoral students coming outside the system of science and higher education pose bigger problems. Once again, some consideration should be given to the reference made under item 2.3: at one point in time the state administration subsidised the enrolment of candidates from industry using tax relieves. The companies exploited the opportunity to encourage enrolment of their employees, without any system of support and those candidates only rarely managed to complete their programmes of study. To avoid any repetition of such cases, during the entry interview the future doctoral candidates are requested to present a clear idea, irrespective of the programme of study being paid by their company or not, about the field of their future research, to indicate a location where the experimental part of their research could be carried out, to list the available equipment and if possible, to nominate their potential mentor. The majority of mentors can be immediately contacted by phone to verify the data. Where the future doctoral student is not able to name his/her mentor, the potential mentor candidates are considered during enrolment and contacted by phone or even invited to come in person for a short interview with the future doctoral student. In this way, from the very beginning some sort of counselling for the programme of study is established for every candidate. As a matter of fact, it may turn out later on that another mentor would be a better solution, which is then made formal using the form Dr.Sc.01. The Faculty does not enrol the candidates who fail to provide strong evidence that they are able to conduct experimental research or the candidates whose idea of research fails to correspond with competences of available mentors that is with the field and the academic area of the programme of study.

3.5. The higher education institution ensures recruitment of interested, talented and highly motivated doctoral students from Croatia and abroad.

Since as a rule the employment by the Faculty, both of teaching assistants and of doctoral students in projects, precedes their enrolment in the doctoral programme of study, the real vacancy is not advertised through the call for enrolment in the doctoral programme of study, but through job openings. In this aspect, the Faculty fully complies with the good practice of the European Research Area. Job openings are advertised in the Croatian language in daily newspapers and in the Official Gazette (Official Journal of the Republic of Croatia), and at the same time in the English language on the web portal Euraxess,[39] in the statutory period of 30 days. To date the above-mentioned has failed to result in any interest shown by foreign job applicants. However, the Faculty is very satisfied with the quality of Croatian job applicants. The number of enrolled students depends greatly on the current level of financing of science in the Republic of Croatia, and varies year after year in accordance with the number of available teaching assistants' or doctoral students' positions.

The migration routes are asymmetric, as is always the case. Some good candidates will go abroad, especially during the years of "scarcity". The Faculty may count on candidates from smaller universities in Croatia, from some components of the University of Zagreb and on a specific number of students from scientific institutes, most of whom are not the Faculty's graduates.

The candidates from Croatian companies in the field of chemical industry and related industries are naturally oriented to the programme of study under consideration and to this Faculty and are largely the Faculty's graduates.

Foreign students are scarce for many reasons. Firstly, as above-mentioned, so far there have been no foreign applicants for job openings. Secondly, there have occasionally been some e-mail enquiries from Asian countries about available positions in scientific projects, but there are no such positions as all positions are covered by calls as explained above. Thirdly, there is some interest in participation in the doctoral programme of study through exchange

programmes, for instance through Erasmus Mundus. The Faculty receives an application from the candidate, makes evaluation concerning feasibility of research, whether research overlaps with the field of competences of potential mentors and whether mentors are willing to accept candidates as mentees. If the response is positive, it is followed by the classification procedure – the accepted applicant is paid only the wage sufficient to cover their costs of life, but not the costs of research. This procedure is lengthy and rigorous, and until now has resulted in two one year visits of a doctoral student from Algeria. In her case the doctoral student found a common interest with her mentor, the research was not overly expensive, the costs are reimbursed to the Faculty from the programme funds, and the doctoral student is formally temporarily enrolled in the Faculty's doctoral programme of study, although she will be awarded the PhD degree by her home university. Fourthly, there is a slight interest of students from the neighbouring countries, but again asymmetric in nature, as typical for migrations. There is a programme of study similar to the one under consideration at two universities in Slovenia (University of Ljubljana, Faculty of Chemistry and Chemical Technology; University of Maribor, Faculty of Chemistry and Chemical Technology). At the University of Belgrade, Faculty of Technology and Metallurgy in Serbia, there are four separate programmes of study, the collective curriculum of which corresponds with the Faculty's programme of study under consideration. There are three separate programmes of study at the University of Tuzla, Faculty of Technology, the curriculum of which collectively corresponds with the programme of study under consideration. There are also many universities in the region (Belgrade, Novi Sad, Sarajevo…) that have doctoral programmes of study in the academic area of chemistry. The experiences show that this programme of study may count on a specific number of students from Bosnia and Herzegovina, members of the Croatian national entity, and a few students from Kosovo, who attend the instruction in the English language.

3.6. The selection procedure for enrolled doctoral students is public and based on selection of the highest quality candidates.

Since the enrolment quota is not fulfilled, it is impossible to speak of selection of the highest quality candidates that is the best candidates. It is only possible to speak of enrolment of adequate and good candidates, and of the procedures ensuring their high quality that is preventing enrolment of poor quality candidates. First, the specific enrolment requirements are listed in the Report about Periodical Internal Evaluation of Doctoral Programmes of Study and in the call for enrolment.[40] As a result, the doctoral programme of study under consideration may only be enrolled by the applicants who completed the undergraduate or graduate university programmes of study (300 ECTS) at the Faculty. The applicants graduating from other university programmes of study in the field of technical, natural, biotechnical and biomedical sciences may enrol in the doctoral programme of study in accordance with the University's Articles of Association[41] and in line with the enrolment requirements for the doctoral programme of study under consideration with the possibility of taking differential exams. The minimum average grade in the undergraduate or graduate programme of study required for enrolment is very good. It is possible to enrol with a lower average grade with recommendations from two university professors or if the applicant is an author/co-author of minimum one paper presented in a congress or published in a journal. According to the call for enrolment, the names and qualifications of the selected applicants and the names of their recommenders shall be publicly listed on the website of the programme of study.

Furthermore, as above-mentioned, in the entry interview the future doctoral candidates are required to present a clear idea of the field of their future research, to indicate the location where the experimental part of their research could be carried out, to list available equipment and if possible, to nominate their potential mentor.

The Faculty has not accepted the candidates who failed to comply with the enrolment requirements or to provide strong evidence of the ability to carry out experimental research and the candidates whose idea of research failed to correspond with the competences of available mentors that is with the field and the academic area of the programme of study.

3.7. The higher education institution ensures transparency of the candidates' selection procedure in compliance with the published criteria and transparency of the appeals procedure.

The motivation of the AZVO to discuss this item is clear to the Faculty. However, it is a fact that the enrolment quota has never been fulfilled to date and there has been no need to additionally rank the candidates other than the basic ranking which considers whether the applicant fulfils the fundamental quality requirements. Since such requirements are indisputable and easily provable, until now there have been no appeals against the decisions on the rejection of enrolment nor have such appeals been expected. The rejected candidates received negative decisions concerning their enrolment applications with explanation. During the entry interview with some candidates, it was indicated to the candidates that they had failed to fulfil the requirements for carrying out experimental research that is that their idea of research had not corresponded with the competences of available mentors, that is with the field and academic area of the programme of study. As a rule, such candidates withdrew their enrolment applications by themselves, and there

was no need for any formal rejection. In any case, the enrolment documentation is orderly filed, and the list of selected applicants is publicly available.

3.8. There is a possibility of recognising previous achievements of doctoral students and applicants for the programme of study.

The Faculty regularly recognises previous achievements relevant to the doctoral programme of study. There are many good practice examples, especially when approving transfer from other, previously enrolled doctoral programmes of study. It is possible to recognise the exams taken, but also any other compulsory and optional forms of work in the doctoral programme of study. Generally, it is carried out based on students' requests submitted in writing and adequate decisions, prepared by Manager of the Programme of Study and Vice Dean for Science and International Cooperation, and deliberated by the Council of the Doctoral Programme of Study. The candidate has an obligation to submit relevant documentation for every item. Caution is required when recognising published scientific papers. More specifically, in accordance with the Ordinance on Doctoral Programmes of Study at the University of Zagreb,[15] the Instruction about ECTS Credit Allocation for Optional Forms of Work[42] in the framework of the doctoral programme of study Chemical Engineering and Applied Chemistry and the Instruction about ECTS Credit Allocation for Other Compulsory Forms of Work[43] in the framework of the doctoral programme of study Chemical Engineering and Applied Chemistry, the papers, especially the papers in the compulsory segment, should cover the doctoral dissertation topic, and the foregoing recognition cannot be carried out prior to approving the doctoral dissertation topic. Similarly, in accordance with the Decision on the Amendment to the Decision on the Mandatory Requirement for Approaching the Defence of Doctoral Dissertation,[24] prior to defending doctoral dissertation, the applicant has an obligation to publish minimum one paper covering the doctoral dissertation topic in a journal cited in the tertiary database of Web of Science (WoS). It is implied that the paper needs to include new insights; any older paper or papers published earlier may prove the competences of the candidate, but may not serve as a foundation for the academic PhD degree. In this way, the programme of study is protected from the possibility of becoming a breeding ground for "new" doctors of science based on their "lapsed work" and "previous merits" that is a generator of obsolete and irrelevant scientific information.

3.9. The rights and obligations of the doctoral student are regulated under relevant acts of the higher education institution and under the Studying Agreement which ensures a high level of institutional and mentoring support to doctoral students.

The fundamental document regulating the Rights and Obligations of Doctoral Students is the Ordinance on Doctoral Programmes of Study at the University of Zagreb[15] repetitively indicated above. Pursuant to Article 11 thereof, the doctoral student shall submit a Progress Report to the Council of the Doctoral Programme of Study once a year (with presentation of research, as appropriate), in the University's form. The Faculty collects such reports in the University's form Dr.Sc.04[2] on regular basis and analyses them. Furthermore, the doctoral student is entitled to a single change of their mentor or topic with a request submitted in writing and the opinion of the previous mentor in the University's form Dr.Sc.06.[17] Prior to defending doctoral dissertation the doctoral student has an obligation to publish, or to have approved for publication, minimum one internationally refereed scientific paper, thematically related to the PhD research (as a sole or one of the chief authors). A scientific paper is qualifying only for a single doctoral student. The Faculty made this provision more rigorous under the Decision on the Amendment to the Decision on the Mandatory Requirement for Approaching the Defence of Doctoral Dissertation,[24] according to which Decision prior to defending doctoral dissertation, the applicant has an obligation to publish minimum one paper covering the doctoral dissertation topic in a journal cited in the tertiary database of Web of Science (WoS). The additional requirement was introduced in order to increase the scientific quality of doctoral dissertations and to ensure independent international evaluation of research. In this procedure, the list of permissible journals excludes the journals Chemical and Biochemical Engineering Quarterly, which is the official journal of the Faculty, and *Kemija u industriji*, edited by a member of the Faculty staff. This was also done in order to allow a completely independent external evaluation of research. Article 12 of the Ordinance on Doctoral Programmes of Study at the University of Zagreb regulates the status of the doctoral student who may be a junior researcher or a teaching assistant whose costs of the programme of study are covered by the system of science and higher education, a fellow of Croatian or international fellowships, a doctoral student whose costs of the programme of study are covered by a legal person which is their employer, and a self-paying doctoral student.

The support for doctoral students is also provided in many other ways. For instance, in the first semester Manager of the Programme of Study holds a lecture on the structure of the programme of study. The presentation of this lecture[44] is available all the time on the website of the programme of the study. The website of the programme of the study also includes the Instruction for Doctoral Students concerning the Administrative Aspect of the Programme of Study.[45] It also includes all the forms related to the doctoral programme of study prepared by the University and the Faculty.

Moreover, there are also all relevant ordinances and decisions listed. The Students' Administration Office has a special employee responsible for working with students of postgraduate programmes of study who is available to students every workday in the period from 9.00 am to 3.00 pm. Manager of the Programme of Study and Vice Dean for Science and International Cooperation also reply promptly to any enquiries.
During enrolment every doctoral student signs the Studying Agreement regulating the rights and obligations of the doctoral student and of the Faculty. The format of the Agreement depends on the status of the doctoral student pursuant to Article 12 of the Ordinance on Doctoral Programmes of Study at the University of Zagreb.[15] For enrolment in higher years, the Annexes to the Agreement are signed.

3.10. The institutional support is provided for successful progress of the doctoral student in the doctoral programme of study.

The Ordinance on Doctoral Programmes of Study at the University of Zagreb[15] does not cover this area, as it is specific for every component of the University. The Faculty does not consider it necessary to elaborate this section under a separate ordinance. The Faculty instead relies on the national Ordinance on the Requirements for Election to Research Ranks. The promotion requirements in the field of natural sciences, academic area of chemistry are so high that they strongly motivate mentors to cooperate with doctoral students in publishing scientific papers. In the field of technical sciences, the Faculty enhanced the national criteria under the internal Recommendations for Election to Academic, Research, Teaching and Associate Ranks,[3] which has increased the scientific productivity in the field of technical sciences as well. The Scoring System for Applicants Elected to the Academic Rank of Assistant Professor[38] should also be included here. This is additional motivation for students in the doctoral programme of study who count on the position of assistant professor at the Faculty and introduces a healthy competitive spirit among them. Recently, the Faculty has also introduced Ivan Plotnikov Award[46] that was given for calendar years 2015 and 2016, respectively, to the most successful doctoral student or postdoctoral student according to the number of publications in a single year. Hence, there is a sound research climate at the Faculty stimulating publication of scientific results. Without any exaggeration, it can be said that all scientific papers of doctoral students (212 of them in the WoS database that is 220 in the Scopus database from 1 January 2012 to 31 December 2016) were published with the institutional support.
In terms of presenting papers in international conferences, there are some funds allocated for this purpose at the University. They are allocated according to the calls for the so-called academic mobility and published annually in two or three rounds. The call includes a category entitled mobility of doctoral students (conference participation fees). This method was used in the last five years to finance participation of about 15 doctoral students in international conferences, exclusively from the ranks of the Faculty's employees (teaching assistants and doctoral students). Until 2013 the participation of doctoral students in Croatian and international conferences was financed from the funds of Z-projects of the MZOS. Since the teachers of the Faculty were very successful in having their projects approved, the participation of the then junior researchers in international conferences was not disputable. After 2013 the conference participation was financed from the funds of the HRZZ's projects and European projects and the funds allocated by the University in accordance with the Programme Agreements with the MZOS through the calls for short-term research grants, in which calls the Faculty was among the most successful components of the University in the previous period. Some conference participations are funded from the so-called cooperation funds that is joint projects with industry. Given the fact that the total funds were reduced, the conference participation has become more seldom, but has not been completely phased out. As above-mentioned, the biggest problems are posed by doctoral students coming from the industrial entities. Such doctoral students sometimes do not even have the support from their companies for their studying, let alone for participation in international scientific conferences which implies absence from work for many days. There is not much the Faculty can do in this respect.

4. THE CURRICULUM AND LEARNING OUTCOMES OF THE PROGRAMME OF STUDY

4.1. The curriculum and the quality of the doctoral programme of study are in compliance with the internationally adopted standards.

The Report about Periodical Internal Evaluation of Doctoral Programmes of Study underlines that "the curriculum of the doctoral programme of study is in compliance … … with contemporary trends in chemical engineering and applied chemistry, which includes the following elements: consistent application of the methodology of the profession, inductive approach to scientific research and orientation to modern interdisciplinary courses of research. The instruction is continuously adapted to be in compliance with the development of science and profession and changes in the economic and social environment." Furthermore, "the programme of study is focused on acquisition of new and relevant knowledge and skills which are: a) from the area of the profession and represent added value that is expand the specific knowledge in the framework of the topic of PhD research, b) research-related, and contribute to research quality and development of research abilities of the doctoral student (publishing and presenting research results, approach to solving problems, etc. and c) transferrable, which will be useful to the doctoral student for their further professional development (time management, development of the profession and other skills)". Similarly, "the main determinant of the programme is a focus on scientific research that will increase competitiveness and international recognisability of the current research capacities, and contribute to internationalisation. In the execution of the curriculum of the doctoral programme of study special attention is given to enhancement of cooperation with industry and economy and to development of transferrable skills to make doctoral students readier for the challenges of transferring knowledge in the global surrounding."

In the context of international character, the Report about Periodical Internal Evaluation of Doctoral Programmes of Study specifies that "it is expected… that a great contribution to the programme quality will be given by internationally recognised scientists from other Croatian and foreign institutions who will participate in the curriculum execution and enable the participants in the programme of study to develop scientifically in their institutions." It was above-mentioned that there are 6 teachers from foreign countries participating in the curriculum execution. In the period from 1 January 2012 to 31 December 2016 four doctoral dissertations were defended in which one of the two mentors was from a foreign country. It is a common practice that one part of experiments required for doctoral dissertation development is carried out abroad if there is a lack of available equipment in Croatia, in which case the doctoral student may use the equipment in person while visiting a foreign scientific and research institution. The Report about Periodical Internal Evaluation of Doctoral Programmes of Study indicates that the doctoral programme of study under consideration is comparable with the following doctoral programmes of study of highly ranked foreign universities:

- MIT–Department of Chemical Engineering; Doctor of Philosophy or Doctor of Science in Chemical Engineering;
- University of Toronto, Chemical Engineering and Applied Chemistry;
- Carnegie Mellon, Chemical Engineering;
- The University of Manchester, Chemical Engineering and Analytic Science;
- McGill University, Department of Chemical Engineering, Doctor of Philosophy;
- Aston University, School of Engineering & Applied Science;
- University of Rostock, Science and Engineering of New Materials (Physics, Chemistry, Biology and Technology of New Materials).

The learning outcomes at the curriculum level (see introductory section of this document) are adapted in accordance with the document *Bologna Recommendations: Recommendations for Chemical Engineering Education in a Bologna Three Cycle Degree System*[1] and therefore are fully in compliance with the requirements of the European Federation of Chemical Engineering (EFCE).

In terms of interdisciplinarity, the curriculum of the doctoral programme of study under consideration is interdisciplinary *per se* and allows completion in the field of technical sciences, academic area of chemical engineering and in the field of natural sciences, academic area of chemistry. The instruction, in addition to chemical engineers and chemists also includes mathematicians, physicists, mechanical engineers and electrical engineers. In this context, the Report about Periodical Internal Evaluation of Doctoral Programmes of Study specifies: "interdisciplinarity of the doctoral programme of study allows development of the doctoral student in the field of natural or technical sciences in line with interests and in agreement with the potential mentor. The method of execution of the curriculum of the doctoral programme of study will additionally encourage sharing of knowledge, discussions and communication between the doctoral student and the mentor through discussion groups." In the period from 1 January 2012 to 31 December 2016 34 doctoral dissertations were registered under dual mentoring. Practically all of them concerned research at least partially carried out outside the students' home institution, and for 17 of them the mentors were

from different fields or areas. The following combinations were registered: chemical engineering + chemistry, chemical engineering + environmental engineering, medicine + chemistry, chemistry + electrical engineering, biochemical engineering + chemical engineering, chemical engineering + physics, biochemical engineering + chemistry, chemical engineering + electrical engineering, chemical engineering + computing. Nevertheless, there are many doctoral dissertations with only one mentor thematically situated in the marginal area of chemical engineering, chemistry and other areas and having a considerable interdisciplinary character.

4.2. The learning outcomes specified at the level of the programme of study and its segments are in compliance with level 8.2 of the Croatian Qualifications Framework (HKO, Croatian: *Hrvatski kvalifikacijski okvir*). They clearly describe the competences doctoral students will develop in the doctoral programme of study and ethical requirements for the scientific and research/artistic work.

Resulting from the document of the EFCE,[1] the learning outcomes of the doctoral programme of study under consideration are of a very high level and are repeated below. The doctor of science has the ability:

1. To systematise knowledge, skills and competences for the respective field and academic area of the programme of study
2. To evaluate the skills and methods for experimental and theoretical research relating to the respective field and academic area of the programme of study
3. To design a real research process, including all the respective professional and scientific aspects
4. To conduct large-scale scientific research extending the frontiers of technology and knowledge
5. To publicise segments of the original scientific research in refereed international publications or patent offices
6. To develop a plan of research and of required resources in international context
7. To communicate with their peers, the larger international scholarly community and with society in general about their ideas or the field of their scholarly and professional interest
8. To promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge-based society.

The table below outlines the structure of the doctoral programme of study under consideration:

The doctoral dissertation accounts for two thirds of the total number of credits and clearly shows the focus of the programme of study on research that is on development of new knowledge. The doctoral dissertation and the related public presentation of the doctoral dissertation topic may be linked with any of the eight learning outcomes at the level of the programme of study. The fundamental and elective courses are linked primarily with the first and the second learning outcome at the level of the programme of study. Of other compulsory forms of work, the research seminar paper and the discussion group are also connected with the doctoral dissertation topic and are linked with the third, sixth and seventh learning outcomes, a paper published in a journal cited in tertiary database is primarily focused on the fifth learning outcome, participation in scientific conferences with a report is linked with the seventh and the eighth learning outcome. The doctoral students select workshops, organised by the University or by the Faculty, according to their own discretion. The workshops are mostly connected with acquisition of transferrable skills that is the seventh and the eighth learning outcome, although workshops for the acquisition of knowledge connected with the first and the second learning outcome – because of flexibility and focus on the interest of doctoral students – are also recognised. The doctoral students select other optional forms of work according to their affinity, but need to collect minimum 12 ECTS credits in this way. In this aspect, the programme of study is flexible, and it is easy to link specific forms of work with adequate learning outcomes at the level of the programme of study. There is more information about the structure of the programme of study in the Report about Periodical Internal Evaluation of Doctoral Programmes of Study, presentation concerning the introductory lecture on the structure of the programme of study,[44] the Instruction about ECTS Credit Allocation for Optional Forms of Work,[42] the Instruction about ECTS Credit Allocation for Other Compulsory Forms of Work.[43] For compulsory and optional forms of work which are not directly linked with the instruction or doctoral dissertation development, the doctoral student submits a request and proof of fulfilment of obligations to the Students' Administration Office, which documents are discussed by the Council of the Doctoral Programme of Study. The Council renders a decision whereby the ECTS credits are either recognised or not in accordance with the above-mentioned instructions.

4.3. Learning outcomes of the doctoral programme of study are logically and clearly linked with learning outcomes of the specific teaching contents, mentoring and research work.

As indicated in the previous item, there is a clear link between learning outcomes at the level of specific forms of activity in the doctoral programme of study, including the instruction in courses, with learning outcomes at the level

of the curriculum. Doctoral students select compulsory and elective courses during enrolment, based on previous agreement with the counsellor of the programme of study or with the potential mentor, and with assistance of Manager of the Programme of Study and Vice Dean for Science and International Cooperation, to suit them best to the needs of research work. In this way, all learning outcomes at the level of the curriculum are interwoven and consistent. There are practically no blind alleys. Everything is done with a special focus on doctoral dissertation of high quality as an important product, and the high quality doctor of science as an even more important product of the doctoral programme of study.

4.4. The curriculum of the doctoral programme of study contributes to the achievement of learning outcomes and competences in accordance with level 8.2 of the HKO.

The doctoral student's file contains all relevant data. It includes all the necessary documents, exam application forms, forms Dr.Sc.XX, requests and decisions for ECTS credit recognition; published papers, participation in conferences, etc. are verified. There are orderly records maintained for every doctoral student. Only after fulfilling all other obligations, the doctoral dissertation may be submitted for evaluation. The scientific productivity of the doctoral student and of the doctoral programme of study as a whole are regularly monitored and analysed.

4.5. The educational methods (and allocation of ECTS credits, as defined) in different activities of the doctoral student are adequate for level of 8.2 of the HKO and ensure achievement of clearly defined learning outcomes.

This is also to the largest extent elaborated under item 4.2 above. Suffice is to say here only that *ex cathedra* instruction is applied extremely rarely. More specifically, usually up to 20 students are enrolled per year, each of them is able to select their portfolio of compulsory and elective courses, and thus carrying out of classical instruction would be irrational when considered from such aspect only. Therefore, teachers commonly seek to find a topic from their course closest to the field of the future doctoral dissertation of the doctoral student and to achieve desired learning outcomes through individual work with the doctoral student, in the form of seminars and consultations. Other forms of activity by their definition do not correspond with *ex cathedra* instruction.

4.6. The programme ensures acquisition of generic (transferrable) skills.

This is also already indicated under item 4.2. Some examples of activities in the area of acquisition of generic skills will be listed in more detail below.

From 19 August 2013 to 18 February 2015 the project of Modernising Doctoral Education through Implementation of the Croatian Qualifications Framework (MODOC)[47] was implemented at the University, co-funded by the European Union. The Office for Doctoral Programmes of Study and Curricula of the University was responsible for the project implementation. The project curriculum is also available online.[48] It included the workshops in which doctoral students were able to acquire generic competences. The Faculty informed its doctoral students about them and some of the students completed the training successfully. The Council of the Doctoral Programme of Study recognised the workshops as a basis for acquisition of ECTS credits.

From 18 June 2015 to 17 September 2016 at the Faculty of Mining, Geology and Petroleum Engineering of the University of Zagreb and at the Faculty the TARGET project was implemented – Establishing Higher Education Standards for Qualifications and Occupations in the Sector of Mining, Geology and Chemical Technology.[49] The funds were allocated from the European Social Fund in the framework of the project Human Resources Development 2007 – 2013 (number of the project: HR.3.1.15-0002) with mediation of the MZOS and the Agency for Vocational Education and Training and Adult Education. The project concerned quality assurance system in higher education in the sector of mining, geology and chemical technology in the Republic of Croatia, comparisons of qualifications acquired in different higher education institutions in the Republic of Croatia and the EU and enhancement of recognisability of such qualifications in the Croatian and the EU labour market. The project objectives are: (1) to develop the standard for occupations and the standard for qualifications in the sector and their entry in the Croatian Qualifications Framework Register, (2) to improve the current programmes of study at the Faculty of Mining, Geology and Petroleum Engineering and the Faculty of Chemical Engineering and Technology, and (3) to improve the competences of teachers and students. The working package of Enhancing Competences of Teachers includes the so-called Initial Training for Acquisition of Fundamental Competences of Teachers. This five-month programme was used to train 20 (senior) teaching assistants at the Faculty, mostly doctoral students with the aim of enhancing their prospects in the labour market after they complete the doctoral programme of study. The Council of the Doctoral Programme of Study has recognised the workshops as a basis for the acquisition of ECTS credits.

On 12 and 13 January 2016 and on 26 and 27 January 2016 the Faculty organised a two-day workshop for its doctoral students entitled "How to give effective oral presentation of your research?" On 29 and 30 January 2016 another

workshop was organised: "How to publish your paper in a research journal?" The workshop was organised in cooperation with the Association for Promotion of Multimedia Education (UMNA). The Faculty financed this workshop from the funds raised from tuition fees, and the Council of the Doctoral Programme of Study has recognised the workshops as a basis for the acquisition of ECTS credits.

4.7. The teaching contents are in function of current and future research work and training of doctoral students (individual teaching plan, generic skills, etc.).

This is covered to the largest extent under item 4.5. It should be added that in accordance with the Ordinance on Doctoral Programmes of Study at the University of Zagreb[15] pursuant to Article 5, item 5, in order to achieve interdisciplinarity, doctoral students, with explanation and consent of their mentor, and with consent of the Council of the Doctoral Programme of Study, are allowed to enrol in parts of instruction and to accomplish segments of research and artistic creation at any component of the University or other institutions. This opportunity was seldom used by doctoral students of the doctoral programme of study under consideration, but was more often used by doctoral students from other components of the University, who enrolled in courses in the doctoral programme of study under consideration.

4.8. The programme ensures quality through international cooperation and mobility of teachers and doctoral students.

The doctoral programme of study under consideration has a clearly pronounced international component, manifested as follows:

- The programme of study is comparable with the doctoral programmes of study of highly ranked foreign universities (see item 4.1).
- There are 6 teachers from foreign countries participating in the programme of study.
- In the period from 1 January 2012 to 31 December 2016 four doctoral dissertations were defended, for which doctoral dissertations one of the two mentors was from a foreign country.
- In the period from 1 January 2012 to 31 December 2016 doctoral students published 212 scientific papers in foreign scientific journals related with the doctoral dissertation topic, cited in the database of World of Science (WoS). A large number of papers were published in cooperation with foreign co-authors.
- In the period from 1 January 2012 to 31 December 2016 mentors published 634 scientific papers in foreign scientific journals cited in the database of Web of Science. A large number of papers were published in cooperation with foreign co-authors.
- From 1 January 2007 to date the Croatian Scientific Bibliography (CROSBI)[50] database registered 1407 conference reports, of which reports more than one third accounted for foreign conference reports. The reports were authored by teachers, mentors and doctoral students.
- Through mobility programmes Erasmus+, Erasmus Mundus and CEEPUS and other programmes, the Faculty regularly receives guests from foreign countries. From the academic year 2003/2004 to date the database of international cooperation of the University[51] registered 167 visits of guests from foreign universities, 15 of which visits concerned cooperation agreements, 36 visiting lectures, 9 project meetings and 882 scientific visits. During all those visits contacts were established with teachers, mentors and doctoral students at the Faculty, primarily the academic staff of the Faculty.
- For the same period, the database registered 248 visits of the Faculty's academic staff to foreign countries, 22 of which visits concerned cooperation agreements, 12 visiting lectures, 6 project meetings, 116 scientific visits and 60 conference participations. It should be indicated that there is no requirement to register international conferences, and therefore their number is much larger. The visits were related to the visits of teachers, mentors and doctoral students of the Faculty. The Faculty Council approves regularly the visits of doctoral students – the Faculty's employees – to foreign institutions for their professional development.
- The Faculty has active projects with an international component: there is 1 project from Horizon 2020 line, 1 research fellowship from Marie Sklodowska-Curie line, 2 projects from COST line, 1 project from NEWFELPRO line has recently ended, there are 6 active CEEPUS networks and a large number of bilateral projects. All of them involve teachers, mentors and doctoral students – the Faculty's employees. Such project were also implemented earlier, see the website of the Faculty.[52]
- The number of foreign students is very small, but they nevertheless come to Croatia from countries like Kosovo, Bosnia and Herzegovina, Iran… The interest in parts of the doctoral programme of study has been registered through Erasmus Mundus programme. To date a doctoral student from Algeria has participated twice in the programme.

- The Faculty is familiar with the European Charter for Scientists and the Code of Conduct for the Recruitment of Scientists and fully applies the respective principles. In accordance with such principles, the Faculty was able to conclude international agreements on exchange also involving doctoral students, such as the agreement in the framework of the programmes Erasmus+,[53] Erasmus Mundus,[54] international partnerships established by the Faculty[55] or the University.[56]
- The University issues a call for the so-called academic mobility annually in two or three rounds and approves coverage of costs for conference participation of doctoral students. In the last five years this method was used to finance conference participation of about 15 persons, solely from the ranks of the Faculty's employees (teaching assistants, doctoral students).
- The Ordinance on Doctoral Programmes of Study at the University of Zagreb[15] allows writing of doctoral dissertation in a foreign language. All forms of Dr.Sc.XX are also available in their English versions. In the period from 1 January 2011 to 31 December 2015 six students used the opportunity and wrote their doctoral dissertation in the English language.
- The Ordinance on Doctoral Programmes of Study at the University of Zagreb[15] allows development of doctoral dissertation according to the Scandinavian model. One example of such doctoral dissertation was registered, as well as a few examples of doctoral dissertations the format of which was in between the Scandinavian model and the model of scientific monograph.

IV. Tables

Table 1: Teachers

Teacher (first and last name/institution) link to CROSBI	**Research (or academic) rank and field/academic area of election**	**A**	**B**	**C**	**Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher**	**Workload (normed hours)**[a,b,c]
Vesna Tomašić https://bib.irb.hr/lista-radova?autor=179216	Full professor Technical sciences / Chemical engineering	7	25	7	Chemical reactor analysis and modelling (lectures) (1/3)	21
					Working load – 1st and 2nd Bologna cycle	444
					Working load at other institutions	
					Overall working load	465
Zoran Gomzi https://bib.irb.hr/lista-radova?autor=13886	Professor emeritus Technical sciences / Chemical engineering	6	9	13	Chemical reactor analysis and modelling (lectures) (1/3)	18
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Igor Plazl University of Ljubljana, Faculty of Chemistry and Chemical Technology Slovenia https://www.researchgate.net/profile/Igor_Plazl/publications	Full professor Technical sciences / Chemical engineering	16	127	13	Chemical reactor analysis and modelling (lectures) (1/3)	21
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Zvjezdana Findrik Blažević https://bib.irb.hr/lista-radova?autor=252884	Associate professor Technical sciences / Chemical engineering	14	44	8	Biochemical engineering (lectures) (1/4)	0
					Working load – 1st and 2nd Bologna cycle	563,5
					Working load at other institutions	
					Overall working load	563,5
Ana Vrsalović Presečki https://bib.irb.hr/lista-radova?autor=231960	Associate professor Technical sciences / Chemical engineering	10	41	8	Biochemical engineering (lectures) (1/4)	0
					Working load – 1st and 2nd Bologna cycle	554,5
					Working load at other institutions	
					Overall working load	554,5
Bruno Zelić https://bib.irb.hr/lista-radova?autor=230393	Full professor Technical sciences / Chemical engineering	18	80	10	Biochemical engineering (lectures) (1/4)	0
					Working load – 1st and 2nd Bologna cycle	420
					Working load at other institutions	
					Overall working load	420
Marko Rogošić https://bib.irb.hr/lista-radova?autor=189535	Full professor Technical sciences / Chemical engineering	9	24	9	Chemical engineering thermodynamics (lectures) (1/1)	60
					Polymer chemistry and engineering (lectures) (1/3)	21
					Working load – 1st and 2nd Bologna cycle	364
					Working load at other institutions	
					Overall working load	445
Aleksandra Sander https://bib.irb.hr/lista-radova?autor=209886	Full professor Technical sciences / Chemical engineering	7	20	7	Separation processes (lectures) (1/1)	60
					Working load – 1st and 2nd Bologna cycle	445
					Working load at other institutions	
					Overall working load	505

Teacher (first and last name/institution) link to CROSBI	**Research (or academic) rank and field/academic area of election**	**A**	**B**	**C**	**Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher**	**Workload (normed hours)*a,b,c***
Jasna Prlić Kardum https://bib.irb.hr/lista-radova?autor=211932	Professor Technical sciences / Chemical engineering	5	14	5	Transport phenomena (lectures) (1/1)	60
					Crystallization (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	339
					Working load at other institutions	
					Overall working load	429
Ivica Gusić https://bib.irb.hr/lista-radova?autor=50461	Full professor Natural sciences / Mathematics	6	8	3	Elements of engineering mathematics (lectures) (1/1)	60
					Working load – 1st and 2nd Bologna cycle	480
					Working load at other institutions	
					Overall working load	540
Sandra Babić https://bib.irb.hr/lista-radova?autor=224150	Full professor Natural sciences / Chemistry	20	123	13	Chemical analysis in quality system (lectures) (1/1)	60
					Chromatographic methods in environmental analysis (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	289,5
					Working load at other institutions	
					Overall working load	379,5
Tomislav Bolanča https://bib.irb.hr/lista-radova?autor=233894	Full professor Natural sciences / Chemistry	21	69	9	Water chemistry (lectures) (1/3)	60
					Chemometrics (lectures) (1/2 – elective course)	30
					Working load at 1st and 2nd Bologna cycle	260
					Working load at other institutions	
					Overall working load	350
Marijana Hranjec https://bib.irb.hr/lista-radova?autor=245291	Associate professor Natural sciences / Chemistry	11	93	12	Heterocycles: current trends and future perspective (lectures) (1/4)	0
					Modern trends in organic synthesis (lectures) (1/4)	0
					Medicinal chemistry (lectures) (1/3)	0
					Working load – 1st and 2nd Bologna cycle	305
					Working load at other institutions	
					Overall working load	305
Tatjana Gazivoda Kraljević https://bib.irb.hr/lista-radova?autor=235885	Associate professor Natural sciences / Chemistry	10	32	9	Heterocycles: current trends and future perspective (lectures) (1/4)	0
					Medicinal chemistry (lectures) (1/3)	0
					Modern trends in organic synthesis (lectures) (1/4)	0
					Working load – 1st and 2nd Bologna cycle	385
					Working load at other institutions	
					Overall working load	385
Silvana Raić-Malić https://bib.irb.hr/lista-radova?autor=203323	Full professor Natural sciences / Chemistry	17	46	14	Heterocycles: current trends and future perspective (lectures) (1/4)	0
					Modern trends in organic synthesis (lectures) (1/4)	0
					Medicinal chemistry (lectures) (1/3)	0
					Positron emission tomography (PET) chemistry and PET radiopharmaceuticals (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	324
					Working load at other institutions	

Teacher (first and last name/institution) link to CROSBI	Research (or academic) rank and field/academic area of election	A	B	C	Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher	Workload (normed hours)[a,b,c]
					Overall working load	324

Teacher (first and last name/institution) link to CROSBI	Research (or academic) rank and field/academic area of election	A	B	C	Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher	Workload (normed hours)[a,b,c]
Irena Škorić https://bib.irb.hr/lista-radova?autor=235422	Professor Natural sciences / Chemistry	18	126	12	Heterocycles: current trends and future perspective (lectures) (1/4)	0
					Modern trends in organic synthesis (lectures) (1/4)	0
					Principles and applications of organic photochemistry (lectures) (1/1)	60
					Working load – 1st and 2nd Bologna cycle	290,5
					Working load at other institutions	
					Overall working load	350,5
Saša Omanović McGill University Department of Chemical Engineering Montreal, Canada http://apps.webofknowledge.com/Search.do?product=WOS&SID=Y2esXgS7gmTMuVKTsSC&search_mode=GeneralSearch&prID=2b29df1b-a4a0-483c-801d-5e7a4d9f8b3a	Professor Technical sciences / Chemical engineering	29	194	24	Electrochemistry and materials of electrochemical conversion and storage devices (lectures) (1/3)	18
					Chemical approach to nanotechnology: fundamentals and applications (lectures) (1/1 – elective course)	60
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Zoran Mandić https://bib.irb.hr/lista-radova?autor=160011	Professor Technical sciences / Chemical engineering	5	31	13	Electrochemistry and materials of electrochemical conversion and storage devices (lectures) (1/3)	21
					Working load – 1st and 2nd Bologna cycle	244,5
					Working load at other institutions	
					Overall working load	265,5
Marijana Kraljić Roković https://bib.irb.hr/lista-radova?autor=239606	Associate professor Technical sciences / Chemical engineering	3	19	8	Electrochemistry and materials of electrochemical conversion and storage devices (lectures) (1/3)	21
					Working load – 1st and 2nd Bologna cycle	274,5
					Working load at other institutions	
					Overall working load	295,5
Ana Lončarić Božić https://bib.irb.hr/lista-radova?autor=231675	Professor Technical sciences / Chemical engineering	20	165	15	Environmental management tools (lectures) (1/2)	30
					Advanced oxidation processes for water treatment (lectures) (1/3 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	359
					Working load at other institutions	
					Overall working load	389
Hrvoje Kušić https://bib.irb.hr/lista-radova?autor=245243	Assistant professor Technical sciences / Chemical engineering	25	200	17	Environmental management tools (lectures) (1/2)	30
					Advanced oxidation processes for water treatment (lectures) (1/3 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	336
					Working load at other institutions	
					Overall working load	366
Hrvoje Ivanković https://bib.irb.hr/lista-radova?autor=107251	Full professor Technical sciences / Chemical engineering Technical sciences / Fundamental Technical sciences	6	28	14	Inorganic nonmetallic materials (lectures) (1/2)	30
					Silicates and silicate glasses (lectures) (1/2 – elective course)	30
					New ceramic materials and ceramic processing (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	297
					Working load at other institutions	75

Teacher (first and last name/institution) link to CROSBI	Research (or academic) rank and field/academic area of election	A	B	C	Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher	Workload (normed hours)[a,b,c]
					Overall working load	462

Teacher (first and last name/institution) link to CROSBI	Research (or academic) rank and field/academic area of election	A	B	C	Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher	Workload (normed hours)[a,b,c]
Stanislav Kurajica https://bib.irb.hr/lista-radova?autor=186666	Full professor Technical sciences / Chemical engineering Technical sciences / Fundamental Technical sciences	15	52	13	Inorganic nonmetallic materials (lectures) (1/2)	30
					Silicates and silicate glasses (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	272,5
					Working load at other institutions	60
					Overall working load	392,5
Marica Ivanković https://bib.irb.hr/lista-radova?autor=127321	Full professor Technical sciences / Chemical engineering Technical sciences / Fundamental Technical sciences	5	44	14	Polymer chemistry and engineering (lectures) (1/3)	18
					Polymer composite materials (lectures) (1/1 – elective course)	60
					Working load – 1st and 2nd Bologna cycle	306
					Working load at other institutions	
					Overall working load	384
Ljerka Kratofil Krehula https://bib.irb.hr/lista-radova?autor=236322	Assistant professor Technical sciences / Chemical engineering	13	35	5	Polymer chemistry and engineering (lectures) (1/3)	21
					Functional polymer materials (lectures) (1/3 – elective course)	18
					Working load – 1st and 2nd Bologna cycle	482,5
					Working load at other institutions	
					Overall working load	521,5
Vladimir Dananić https://bib.irb.hr/lista-radova?autor=120953	Associate professor Natural sciences / Physics	4	16	8	Physics and chemistry of nanostructured surfaces and materials (lectures) (1/4)	15
					Working load – 1st and 2nd Bologna cycle	390
					Working load at other institutions	
					Overall working load	405
Mile Ivanda Ruđer Bošković Institute Division of Materials Physics https://bib.irb.hr/lista-radova?autor=135746	Research counsellor Natural sciences / Physics	38	104	24	Physics and chemistry of nanostructured surfaces and materials (lectures) (1/4)	15
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Sanja Lučić Blagojević https://bib.irb.hr/lista-radova?autor=186655	Full professor Technical sciences / Chemical engineering	5	12	9	Physics and chemistry of nanostructured surfaces and materials (lectures) (1/4)	15
					Adhesive processes and systems (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	549,5
					Working load at other institutions	
					Overall working load	594,5
Mirela Leskovac https://bib.irb.hr/lista-radova?autor=175223	Full professor Technical sciences / Chemical engineering	9	29	8	Physics and chemistry of nanostructured surfaces and materials (lectures) (1/4)	15
					Adhesive processes and systems (lectures) (1/2 – elective course)	30
					Engineering of boundary surfaces and tribology (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	532,5
					Working load at other institutions	
					Overall working load	607,5
Gordana Matijašić https://bib.irb.hr/lista-	Professor Technical sciences	6	2	5	Engineering of particulate systems (lectures) (1/1 – elective course)	60

Teacher (first and last name/institution) link to CROSBI	**Research (or academic) rank and field/academic area of election**	**A**	**B**	**C**	**Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher**	**Workload (normed hours)*a,b,c***
radova?autor=240133	/ Chemical engineering				Working load – 1st and 2nd Bologna cycle	400,5
					Working load at other institutions	
					Overall working load	460,5

Teacher (first and last name/institution) link to CROSBI	**Research (or academic) rank and field/academic area of election**	**A**	**B**	**C**	**Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher**	**Workload (normed hours)**[a,b,c]
Igor Dejanović https://bib.irb.hr/lista-radova?autor=268533	Assistant professor Technical sciences / Chemical engineering	8	107	7	Synthesis and process design (lectures) (1/1 – elective course)	60
					Working load – 1st and 2nd Bologna cycle	299,5
					Working load at other institutions	
					Overall working load	359,5
Veljko Filipan https://bib.irb.hr/lista-radova?autor=117544	Full professor Technical sciences / Mechanical engineering	1	1	2	Energetics and the environment (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	657,5
					Working load at other institutions	
					Overall working load	657,5
Igor Sutlović https://bib.irb.hr/lista-radova?autor=186385	Professor Technical sciences / Fundamental Technical sciences	0	0	2	Energetics and the environment (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	409,5
					Working load at other institutions	
					Overall working load	409,5
Elvira Vidović https://bib.irb.hr/lista-radova?autor=239610	Associate professor Technical sciences / Chemical engineering	6	4	5	Modern petroleum refining and petrochemical processes (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	0
					Working load at other institutions	
					Overall working load	0 (sabbatical)
Damir Kralj Ruđer Bošković Institute Division of Materials Chemistry https://bib.irb.hr/lista-radova?autor=120470	Research counsellor Natural sciences / Chemistry	12	56	20	Crystallization (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Nenad Bolf https://bib.irb.hr/lista-radova?autor=220561	Professor Technical sciences / Chemical engineering	5	11	5	Process and plant automatization (lectures) (1/1 – elective course)	60
					Working load – 1st and 2nd Bologna cycle	401
					Working load at other institutions	
					Overall working load	461
Šime Ukić https://bib.irb.hr/lista-radova?autor=268476	Assistant professor Natural sciences / Chemistry	18	66	6	Chemometics (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	570
					Working load at other institutions	
					Overall working load	600
Mira Petrović Catalan Institute for Water Research, ICRA Girona, Spain https://www.researchgate.net/profile/Mira_Petrovic	Professor Natural sciences / Chemistry	54	1358	51	Chromatographic methods in environmental analysis (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	

Teacher (first and last name/institution) link to CROSBI	Research (or academic) rank and field/academic area of election	A	B	C	Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher	Workload (normed hours)[a,b,c]
Dragana Mutavdžić Pavlović https://bib.irb.hr/lista-radova?autor=236333	Associate professor Natural sciences / Chemistry	12	75	9	Modern sample preparation techniques for chromatographic analysis (lectures) (1/1 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	308
					Working load at other institutions	
					Overall working load	308
Predrag Novak University of Zagreb, Faculty of Science https://bib.irb.hr/lista-radova?autor=176404	Full professor Natural sciences / Chemistry	19	77	13	Principles and applications of NMR spectroscopy (lectures) (1/1 – elective course)	60
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Nikola Basarić Ruđer Bošković Institute Division of Organic Chemistry and Biochemistry https://bib.irb.hr/lista-radova?autor=250000	Research counsellor Natural sciences / Chemistry	34	209	17	Principles and applications of fluorescence spectroscopy (lectures) (1/1 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Vesna Volovšek https://bib.irb.hr/lista-radova?autor=79566	Full professor Natural sciences / Physics	2	2	9	Spectroscopic methods in materials research (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	320
					Working load at other institutions	
					Overall working load	350
Mira Ristić Ruđer Bošković Institute Division of Materials Chemistry https://bib.irb.hr/lista-radova?autor=85111	Research counsellor Natural sciences / Chemistry	39	139	23	Spectroscopic methods in materials research (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	

Teacher (first and last name/institution) link to CROSBI	Research (or academic) rank and field/academic area of election	A	B	C	Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher	Workload (normed hours)[a,b,c]
Marija Vuković Domanovac https://bib.irb.hr/lista-radova?autor=250011	Associate professor Technical sciences / Chemical engineering	10	22	6	Processes of treatment of waste streams and bioremedy of environment (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	393,5
					Working load at other institutions	
					Overall working load	393,5
Krešimir Košutić https://bib.irb.hr/lista-radova?autor=195194	Full professor Technical sciences / Chemical engineering	18	148	12	Physical-chemical treatment of water (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	450
					Working load at other institutions	
					Overall working load	450
Danijela Ašperger https://bib.irb.hr/lista-radova?autor=255064	Associate professor Natural sciences / Chemistry	12	71	9	Physical-chemical treatment of water (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	378,5
					Working load at other institutions	
					Overall working load	378,5
Domagoj Vrsaljko https://bib.irb.hr/lista-radova?autor=245265	Assistant professor Technical sciences / Chemical engineering	6	26	5	Engineering of boundary surfaces and tribology (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	383,5
					Working load at other institutions	
					Overall working load	383,5
Lidija Ćurković University of Zagreb Faculty of Mechanical Engineering and Naval Architecture https://bib.irb.hr/lista-radova?autor=189524	Full professor Natural sciences / Chemistry Technical sciences / Mechanical engineering	30	127	12	New ceramic materials and ceramic processing (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Gordana Pehnec Institute for Medical Research and Occupational Health https://bib.irb.hr/lista-radova?autor=222616	Senior Research Associate Natural sciences / Chemistry	4	7	5	Managing air quality (lectures) (1/1 – elective course)	60
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Zlata Hrnjak-Murgić https://bib.irb.hr/lista-radova?autor=120683	Full professor Technical sciences / Chemical engineering	19	43	7	Recycling of polymer and inorganic waste (lectures) (1/2 – elective course)	0
					Functional polymer materials (lectures) (1/3 – elective course)	24
					Working load – 1st and 2nd Bologna cycle	358,5
					Working load at other institutions	
					Overall working load	382,5
Juraj Šipušić https://bib.irb.hr/lista-radova?autor=245906	Professor Technical sciences / Chemical engineering	10	31	8	Recycling of polymer and inorganic waste (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	418
					Working load at other institutions	
					Overall working load	418

Teacher (first and last name/institution) link to CROSBI	**Research (or academic) rank and field/academic area of election**	**A**	**B**	**C**	**Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher**	**Workload (normed hours)*a,b,c***
Emi Govorčin Bajsić https://bib.irb.hr/lista-radova?autor=127332	Full professor Technical sciences / Chemical engineering	2	3	7	Structure and processing of polymer materials (lectures) (1/1 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	307,5
					Working load at other institutions	
					Overall working load	307,5

Teacher (first and last name/institution) link to CROSBI	Research (or academic) rank and field/academic area of election	A	B	C	Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher	Workload (normed hours)[a,b,c]
Sanja Martinez https://bib.irb.hr/lista-radova?autor=205994	Full professor Technical sciences / Chemical engineering	3	1	15	Recent issues in the field of corrosion (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	270,5
					Working load at other institutions	
					Overall working load	300,5
Helena Otmačić Ćurković https://bib.irb.hr/lista-radova?autor=235174	Associate professor Technical sciences / Chemical engineering	7	44	11	Recent issues in the field of corrosion (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	377
					Working load at other institutions	
					Overall working load	407
Stjepan Milardović https://bib.irb.hr/lista-radova?autor=154444	Associate professor Natural sciences / Chemistry	6	10	11	Chemical sensors and biosensors (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	332
					Working load at other institutions	
					Overall working load	362
Ivana Steinberg https://bib.irb.hr/lista-radova?autor=178963	Associate professor Natural sciences / Chemistry	8	52	11	Chemical sensors and biosensors (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	342,5
					Working load at other institutions	
					Overall working load	372,5
Ante Jukić https://bib.irb.hr/lista-radova?autor=240144	Full professor Technical sciences / Chemical engineering	9	18	9	Sustainable solar-hydrogen systems (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	554
					Working load at other institutions	
					Overall working load	584
Zvonimir Glasnović https://bib.irb.hr/lista-radova?autor=240100	Associate professor Technical sciences / Electrical engineering	8	54	6	Sustainable solar-hydrogen systems (lectures) (1/2 – elective course)	30
					Working load – 1st and 2nd Bologna cycle	320
					Working load at other institutions	
					Overall working load	350
Mirjana Metikoš-Huković https://bib.irb.hr/lista-radova?autor=30602	Professor emeritus Technical sciences / Chemical engineering Natural sciences / Chemistry	24	166	32	Semiconductor materials (lectures) (1/1 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Ingrid Milošev Jožef Stefan Institute Department of Physical and Organic Chemistry Ljubljana, Slovenia http://izumbib.izum.si/bibliografije/Y20160621120106-01290.html 1	Professor Natural sciences / Chemistry	38	262	30	Biomedical implant materials (lectures) (1/1 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Mirela Samardžić Josip Juraj Strossmayer University in Osijek Department of Chemistry https://bib.irb.hr/lista-radova?autor=297004	Assistant professor Natural sciences / Chemistry	11	28	5	Chemical analysis of surfactants (lectures) (1/1 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Jadranka Travaš-Sejdić University of Auckland School of Chemical Sciences New Zealand https://www.researchgate.net/	Professor Technical sciences / Chemical engineering	91	825	32	Functional polymer materials (lectures) (1/3 – elective course)	18
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	

Teacher (first and last name/institution) link to CROSBI	**Research (or academic) rank and field/academic area of election**	**A**	**B**	**C**	**Course (and type of tuition) in the doctoral programme of study as well as overall workload of the teacher**	**Workload (normed hours)**[a,b,c]
profile/Jadranka_Travas-Sejdic/publications					Overall working load	
Simon M. Ametamey Federal Institute of Technology Zürich (ETH) Institute of Pharmaceutical Sciences Switzerland https://www.researchgate.net/profile/Simon_Ametamey	Professor Natural sciences / Chemistry	56	516	28	Positron emission tomography (PET) chemistry and PET radiopharmaceuticals (lectures) (1/2 – elective course)	0
					Working load – 1st and 2nd Bologna cycle	
					Working load at other institutions	
					Overall working load	
Jelena Macan https://bib.irb.hr/lista-radova?autor=234432	Associate professor Technical sciences / Chemical engineering	3	4	8	Electron microscopy (workshops) (1/1)	90
					Thermal analysis methods (workshops) (1/1)	90
					Working load – 1st and 2nd Bologna cycle	239
					Working load at other institutions	
					Overall working load	419

[a] Teaching workload in the doctoral programme of study – Course is executed depending on the interest

[b] Working load – 1st and 2nd Bologna cycle is for academic year 2015/16.

[c] Working load at other institutions is for academic year 2014/15.

A = number of relevant journal articles published from 1 January 2011 to 31 December 2015 according to WoS database.

B = number of citations of those papers according to WoS database.

C = *h*-index according to WoS database for the lifetime research activity of the teacher.

Table 2: Mentors and doctoral students (of the „old“ doctoral programmes of study Chemical Engineering and Engineering Chemistry, from 1 January 2011 to 1 September 2016)

Teacher (first and last name/institution*) link to CROSBI**	Research (or academic) rank and field/academic area of election	Workload (normed hours)[a.b.c.d]	A	B	C	D	E	Doctoral student / Dissertation title (Year of defence)	F	G	Number of doctoral candidates who defended their thesis/Number of doctoral candidates who did not defend their thesis before the deadline[e]
Aleksandra Sander https://bib.irb.hr/lista-radova?autor=209886	Full professor Technical sciences / Chemical engineering	682.8	7	150	7			B. Gabrić / Desulphurization of gasoline from catalytic cracking process by environmentally acceptable solvent extraction (2013)	1		3/1
								I. Nežić / Development and optimization of spray drying process for drying of a pharmaceutical ingredient	1		
								T. Penović / Influence of process conditions on application properties of solid particles obtained by spray drying (2014)	3		
								D. Škalec Šamec / The influence of the process conditions on the polymorphism and morphology of *cis*- and *trans*-isomers of entacapone obtained by crystallization from solution (2012)	1		
Ana Lončarić Božić https://bib.irb.hr/lista-radova?autor=231675	Professor Technical sciences / Chemical engineering	325	20	936	15			V. Hocenski / Novel approach towards reducing the environmental impact of ceramic industry based on neural networks (2012)	1		1/0
Ani Radonić University of Split Faculty of Chemistry and Technology https://bib.irb.hr/lista-radova?autor=199981	Associate professor Natural sciences / Chemistry	455.5	4	807	12			M. Zekić / Glucosinolates of selected wild-growing Brassicaceae plants (2013)	2		1/0
Andreja Gajović Ruđer Bošković Institute Division of Materials Physics https://bib.irb.hr/lista-radova?autor=232882#disertacija	Research counsellor Natural sciences / Physics		12	1521	21			B. Nakić-Alfirević / Reuse of solid industrial wastes for modified lime binder production (2013)	1		1/0

Teacher (first and last name/institution*) link to CROSBI**	Research (or academic) rank and field/academic area of election	Workload (normed hours)[a.b.c.d]	A	B	C	D	E	Doctoral student / Dissertation title (Year of defence)	F	G	Number of doctoral candidates who defended their thesis/Number of doctoral candidates who did not defend their thesis before the deadline[e]
Ante Jukić https://bib.irb.hr/lista-radova?autor=240144	Full professor Technical sciences / Chemical engineering	296.45	9	274	9			F. Faraguna / Improvement of carbon nanotube dispersivity in poly(styrene/methacrylate) composites by chemical functionalization (2014)	4		2/1
								T. Karažija / Nanostructured and functional polymer materials based on methacrylate copolymers and carbon nanotubes	1		
								S. Marinović / Prediction of diesel fuels properties by vibration spectroscopy using multivariate analysis and artificial neural network (2011)	3		
Antun Glasnović https://bib.irb.hr/lista-radova?autor=13493	Full professor (retired) Technical sciences / Chemical engineering		0	82	5			A. Šoštarec / Batch process control development and optimization using computer suported recipies (2013)	1		1/1
								M. Sesartić / Modelling the process of heat and mass transfer in complex thermal bridges	0		
Biserka Žinić Ruđer Bošković Institute Divison of Organic Chemistry and Biochemistry https://bib.irb.hr/lista-radova?autor=95066	Senior Research Associate Natural sciences / Chemistry		6	135	6			L. Krstulović / N-sulfonylamidines in pyrimidine series, synthesis and antitumor activity (2012)	5		1/0

Teacher (first and last name/institution*) link to CROSBI**	**Research (or academic) rank and field/academic area of election**	**Workload (normed hours)**[a.b.c,d]	**A**	**B**	**C**	**D**	**E**	**Doctoral student / Dissertation title (Year of defence)**	**F**	**G**	**Number of doctoral candidates who defended their thesis/Number of doctoral candidates who did not defend their thesis before the deadline**[e]
Bruno Zelić https://bib.irb.hr/lista-radova?autor=230393	Full professor Technical sciences / Chemical engineering	360.7	18	295	10			N. Pandurić / Biotransformation of styrene to (S)–styrene oxide using whole cells Pseudomonas sp. VLB120ΔC in different types of reactors	0		4/2
								A. Šalić / Process development of integrated biocatalytic hexanol oxidation in a microreactor (2015)	10		
								Z. Buić / Application of bentonite clay for petrochemical wastewater pretreatment (2013)	1		
								A. Hublin / Development and modeling of whey anaerobic digestion process (2012)	4		
								M. Panjičko / Process development of biogas production through anaerobic digestion of brewery spent grain as a monosubstrate (2015)	1		
								N. Pavlović / Development of mumps virus vaccine production process	1		
Cleo Kosanović Metorological and Hidrological Service Division of Air Quality https://bib.irb.hr/lista-radova?autor=180432	Research counsellor Natural sciences / Chemistry		5	542	15			I. Buljan / High-temperature transformations of aluminosilicate precursors into secondary crystalline products with aimed properties (2012)	3		1/0
Čedomila Milin University of Rijeka Faculty of Medicine Department of Chemistry and Biochemistry https://bib.irb.hr/lista-radova?autor=70123	Full professor Natural sciences / Chemistry	-	12	328	10			O. Petković / Development of analite transfer module in two dimensional fluid chromatography under supercritical conditions	1		0/1

Teacher (first and last name/institution*) link to CROSBI**	**Research (or academic) rank and field/academic area of election**	**Workload (normed hours)**[a.b.c,d]	**A**	**B**	**C**	**D**	**E**	**Doctoral student / Dissertation title (Year of defence)**	**F**	**G**	**Number of doctoral candidates who defended their thesis/Number of doctoral candidates who did not defend their thesis before the deadline**[e]
Danijela Ašperger https://bib.irb.hr/lista-radova?autor=255064	Associate professor Natural sciences / Chemistry	436	12	378	9			D. Tušek / Sorption of imitants of warfare agents on natural and synthetic zeolites (2017)	0		2/3
								D. Drljača / Extraction methods development and optimization for chromatographic analysis of pharmaceuticals in sediment	0		
								M. Safundžić Kučuk / Stability of xylometazoline, dexpanthenol and ectoine in artificial and natural marine water studied under laboratory conditions	0		
								M. Trkmić / Ash characterization of various solid fuels and its impact on environment (2012)	1		
								I. Coha / Rapid determination of $^{89,90}Sr$ in complex samples by Cherenkov counting on chromatographic column	1		
Danijela Bogner Institute of Oceanography and Fisheries Laboratory of Chemical Oceanography and Sedimentology of the Sea https://bib.irb.hr/lista-radova?autor=204923	Senior Research Associate Natural sciences / Chemistry		5	155	8			M. Buljac / Spatial and temporal anthropogenic element distribution in Kaštela bay sediment (2012)	8		1/0
Dario Omanović Ruđer Bošković Institute Division for Marine and Environmental Research https://bib.irb.hr/lista-radova?autor=214643	Research counsellor Natural sciences / Chemistry		25	733	18			F. Caktaš Šagi / Determination of trace metals and nutrients in ground and surface waters in Kaštela area	0		0/1
Darko Gosak Hospira Zagreb d.o.o. https://bib.irb.hr/lista-radova?autor=115066	Research Associate Technical sciences / Chemical engineering		1	43	4			A. Šoštarec / Batch process control development and optimization using computer suported recipies (2013)	1		1/0
Daslav Hranueli University of Zagreb Faculty of Food Technology and Biotechnology https://bib.irb.hr/lista-radova?autor=16520	Full professor (retired) Biotechnical sciences / Biotechnology		14	895	16			B. Borovička / Isolation and structural characterization of novel polyketides, anthrone derivatives obtained via biosynthesis (2012)	1		1/0

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Davor Gracin Ruđer Bošković Institute Division of Materials Physics https://bib.irb.hr/lista-radova?autor=82826	Research counsellor Natural sciences / Physics		9	403	11			N. Zorić / Structural defects and their influence on properties of solar silicate glass	0		0/1
Davor Kralik Josip Juraj Strosssmayer University in Osijek Faculty of Agriculture https://bib.irb.hr/lista-radova?autor=209131	Full professor Biotechnical sciences / Agriculture	400	0	17	3			A. Hublin / Development and modeling of whey anaerobic digestion process (2012)	4		1/0
Dinko Sinčić Zagrebački holding d.o.o. https://bib.irb.hr/lista-radova?autor=78082	Research counsellor Technical sciences / Chemical engineering		1	139	6			B. Ribić/ Development of model for estimation of municipal waste generation using neural networks	1		0/1
Domagoj Vrsaljko https://bib.irb.hr/lista-radova?autor=245265	Assistant professor Technical sciences / Chemical engineering	324	6	159	5			V. Haramija/ Ageing study of synthetic ester-based transformer oil	1		0/1
Dragana Mutavdžić Pavlović https://bib.irb.hr/lista-radova?autor=236333	Associate professor Natural sciences / Chemistry	439	12	478	9			G. Peček / Method development for determination of pesticides residue levels in surface water (2013)	1		1/2
								A. Periša / Development of multicomponent chromatographic methods for determination of pesticide residues in tea samples	0		
								O. Petković / Development of analite transfer module in two dimensional fluid chromatography under supercritical conditions	1		
Dubravko Forčić University of Zagreb Centre for Research and Transfer of Knowledge in Biotechnology https://bib.irb.hr/lista-radova?autor=211105	Research counsellor Biotechnical sciences / Biotechnology		16	397	11			N. Pavlović / Development of mumps virus vaccine production process	1		0/1
Elvira Vidović https://bib.irb.hr/lista-radova?autor=239610	Associate professor Technical sciences / Chemical engineering	275	6	56	5			K. Kraguljac / Modeling of molecular interactions and rheological properties of solutions of polymeric additives in lubricating oils	1		0/1

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Emi Govorčin Bajsić https://bib.irb.hr/lista-radova?autor=127332	Full professor Technical sciences / Chemical engineering	427.5	2	184	7			B. Ormuž Pavić / Influence of micro and nanofillers on the properties of thermoplastic polyurethane and polypropylene blends (2013)	1		1/0
Ernest Meštrović Pliva d.o.o. – TAPI https://bib.irb.hr/lista-radova?autor=195113	Research counsellor Natural sciences / Chemistry		9	500	12			I. Nežić / Development and optimization of spray drying process for drying of a pharmaceutical ingredient	1		0/1
Felicita Briški https://bib.irb.hr/lista-radova?autor=49982	Full professor Technical sciences / Chemical engineering	291.8	9	332	8			D. Kučić / Integration of composting and adsorption processes (2014)	5		3/0
								N. Kopčić / Study of the solid waste aerobic composting process (2011)	5		
								Ž. Herner / Biodegradation of imidacloprid in an open compost pile	1		
Frankica Kapor University of Zagreb Faculty of Mining, Geology and Petroleum Engineering https://bib.irb.hr/lista-radova?autor=168262	Full professor Natural sciences / Chemistry	-	1	55	4			G. Pustaj / Investigation of steels' corrosion in oil industry and their protection by olive leaf extract (2014)	1		1/0
Gloria Gallego Ferrer Polytechnic University of Valencia School of Design Engineering Spain http://www.pubfacts.com/author/Gloria+Gallego+Ferrer	Titular professor Technical sciences / Chemical Engineering		29	751	16			D. Milovac / Synthesis and characterization of hydroxyapatite-biodegradable polymer composite material (2014)	3		1/0
Gordana Marović Institute for Medical Research and Occupational Health Radiation Protection Unit https://bib.irb.hr/lista-radova?autor=113292	Research counsellor Biotechnical sciences / Biotechnology		5	141	6			B. Skoko / Radiological impact of waste from coal-fired power plant on the environment (2014)	3		1/0
Gordana Matijašić https://bib.irb.hr/lista-radova?autor=240133	Professor Technical sciences / Chemical engineering	542.85	6	54	5			Š. Kordić / Micronization of dronedarone hydrochloride in a spiral jet mill	0		0/1

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Gordana Pehnec Institute for Medical Research and Occupational Health Environmental Hygiene Unit https://bib.irb.hr/lista-radova?autor=222616	Senior Research Associate Natural sciences / Chemistry		4	48	5			I. Jakovljević / Spatial and temporal distribution of polycyclic aromatic hydrocarbons in the air	3		0/1
Grace Karminski-Zamola https://bib.irb.hr/lista-radova?autor=20316	Full professor (retired) Natural sciences / Chemistry		22	1260	19			M. Aleksić / Synthesis, photochemical synthesis, QSAR analysis and antitumor activity of novel derivatives of benzothieno- and thienothieno-quinolones (2013)	2		2/0
								I. Sović / Novel heterocyclic compounds: derivatives of isoindoline, synthesis and antitumor evaluation *in vitro* (2012)	5		
Gregor Drago Zupančič University of Nova Gorica Slovenia https://www.researchgate.net/profile/Gregor_Zupancic2	Associate professor Technical sciences / Interdisciplinary Technical sciences		6	220	8			M. Panjičko / Process development of biogas production through anaerobic digestion of brewery spent grain as a monosubstrate (2015)	1		1/0
Helena Otmačić Ćurković https://bib.irb.hr/lista-radova?autor=235174	Associate professor Technical sciences / Chemical engineering	357.5	7	443	11			Z. Hajdari / Self-assembled monolayers of organic acids in seawater metal corrosion protection (2015)	1		1/0
Hrvoje Ivanković https://bib.irb.hr/lista-radova?autor=107251	Full professor Technical sciences / Chemical engineering Technical sciences / Fundamental Technical sciences	345	6	457	14			S. Orlić / Biomimetic approach to synthesis of highly porous bioceramics based on hydroxyapatite (2012)	1		3/2
								M. Ganjto / Preparation of foamed glass using ash of sewage sludge obtained from municipial wastewater treatment	0		
								I. Weigand / Preparation and properties of thin ceramic TiO_2 coatings by sol-gel process	0		
								D. Milovac / Synthesis and characterization of hydroxyapatite-biodegradable polymer composite material (2014)	3		
								M. N. Mužek / Synthesis of a fly ash-based geopolymer and its application as an adsorbent (2014)	2		

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Irella Bogut Josip Juraj Strossmayer University in Osijek Faculty of Education https://bib.irb.hr/lista-radova?autor=221461	Associate professor Natural sciences / Biology	212	1	82	6			J. Kos / Invertebrates in drinking water supply systems of Eastern Croatia	0		0/1
Irena Drmić Hofman University of Split School of Medicine https://bib.irb.hr/lista-radova?autor=219413	Full professor Natural sciences / Chemistry	-	5	325	7			M. Popović / Identification of carbonylated proteins in different stages of colorectal cancer (2016)	1		1/0
Irena Škorić https://bib.irb.hr/lista-radova?autor=235422	Professor Natural sciences / Chemistry	337	18	403	12			M. Zekić / Glucosinolates of selected wild-growing Brassicaceae plants (2013)	2		3/0
								F. Burčul / Acetylcholinesterase inhibition and antioxidative activity of essential oils from selected plants of Ranunculaceae family (2014)	8		
								I. Kikaš / Synthesis, Photochemistry and Photophysics of Novel Conjugated (Hetero)aryl Systems (2012)	8		
Ivana Steinberg https://bib.irb.hr/lista-radova?autor=178963	Associate professor Natural sciences / Chemistry	354	8	452	11			P. Kassal / Development of novel chemical sensors for emerging mobile wireless applications (Razvoj novih kemijskih senzora za nadolazeće mobilne bežične primjene) (2015)	5		2/0
								E. Horak / Chemical optical sensors based on benzimidazole derivatives (2017)	2		
Jacques Barbier University of Poitiers Institute of Chemistry of Environment and Materials in Poitiers France https://www.researchgate.net/profile/Jacques_Barbier_jr	Full professor Natural sciences / Chemistry		12	1634	22			O. Wittine / Process intensification in phenolic wastewater treatment (Intenzifikacija procesa pročišćavanja otpadnih voda zagađenih fenolom) (2013)	2		1/0
Jadranka Barešić Ruđer Bošković Institute Division of Experimental Physics https://bib.irb.hr/lista-radova?autor=237472	Research Associate Natural sciences / Chemistry		10	133	6			I. Šustić / Carbon isotopes based determination of composition of hardened binders (2012)	1		1/0

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Jasna Prlić Kardum https://bib.irb.hr/lista-radova?autor=211932	Professor Technical sciences / Chemical engineering	593.16	5	60	5			M. Hrkovac / The influence of additives on thermodynamic and kinetic aspects of glycine crystallization (2012)	3		1/0
Jelena Macan https://bib.irb.hr/lista-radova?autor=234432	Associate professor Technical sciences / Chemical engineering	336	3	236	8			K. Paljar / Sol-gel synthesis of polymer-templated porous silica	0		0/1
Jelica Zelić University of Split Faculty of Chemistry and Technology https://bib.irb.hr/lista-radova?autor=143203	Full professor Technical sciences / Chemical engineering	409	2	177	8			M. N. Mužek / Synthesis of a fly ash-based geopolymer and its application as an adsorbent (2014)	2		1/0
Josipa Giljanović University of Split Faculty of Chemistry and Technology https://bib.irb.hr/lista-radova?autor=119831	Associate professor Natural sciences / Chemistry	417.5	9	166	9			A. Prkić / Development of spectrophotometric and potentiometric methods for thiols determination (2013)	13		1/0
Juraj Šipušić https://bib.irb.hr/lista-radova?autor=245906	Professor Technical sciences / Chemical engineering	345	10	196	8			N. Franković Mihelj / Recovery of waste gypsum in preparation of special cement (2012)	2		4/1
								B. Nakić-Alfirević / Reuse of solid industrial wastes for modified lime binder production (2013)	1		
								J. Putrić Brkić / The influence of filler types on properties of filler-bitumen mastics	1		
								I. Šustić / Carbon isotopes based determination of composition of hardened binders (2012)	1		
								M. Kerolli-Mustafa / Characterization and environmental impact assessment of jarosite process tailing waste (Karakterizacija i procjena utjecaja na okoliš otpada nastalog jarosit procesom) (2014)	6		

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Katica Sertić-Bionda https://bib.irb.hr/lista-radova?autor=65381	Full professor Technical sciences / Chemical engineering	165	7	114	6			D. Margeta / Ultrasound-assisted oxidative desulfurization of diesel fuel (2016)	2		2/1
								Z. Adžamić / Kinetic and modeling of light gasoline isomerisation process with Pt/SO_4-ZrO_2 catalyst (2012)	1		
								I. Štagljar Mikac / Adsorptive removal of mercury from light naphtha	0		
Krešimir Košutić https://bib.irb.hr/lista-radova?autor=195194	Full professor Technical sciences / Chemical engineering	555	18	550	12			E. Dražević / Transport of nonionized organics through reverse osmosis and nanofiltration membranes (2014)	7		2/0
								M. Zebić Avdičević / Application of membrane separation processes for textile wastewater treatment (2017)	0		
Slaven Dobrović University of Zagreb Faculty of Mechanical Engineering and Naval Architecture https://bib.irb.hr/lista-radova?autor=203775	Associate professor Technical sciences / Engineering	337	4	19	3			M. Zebić Avdičević / Application of membrane separation processes for textile wastewater treatment (2017)	0		1/0
Laszlo Sipos https://bib.irb.hr/lista-radova?autor=43303	Full professor (retired) Natural sciences / Chemistry		5	1162	19			M. Linarić / Influence of high salinity wastewater on activated sludge (2013)	1		2/1
								T. Ignjatić Zokić / Kinetics and equilibria of adsorption processes in the removal of arsenic from ground water (2012)	3		
								J. Kos / Invertebrates in drinking water supply systems of Eastern Croatia	0		
Lidija Ćurković University of Zagreb Faculty of Mechanical Engineering and Naval Architecture https://bib.irb.hr/lista-radova?autor=189524	Full professor Natural sciences / Chemistry Technical sciences / Mechanical engineering	415	30	571	12			M. Kerolli-Mustafa / Characterization and environmental impact assessment of jarosite process tailing waste (2014)	6		2/0
								M. Trkmić / Ash characterization of various solid fuels and its impact on environment (2012)	1		
Ljubica Matijašević https://bib.irb.hr/lista-radova?autor=82036	Full professor (retired) Natural sciences / Chemistry		4	273	7			A. Hadžić / Development of environmentally acceptable waste management system using LCA methodology	0		0/1

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Marica Ivanković https://bib.irb.hr/lista-radova?autor=127321	Full professor Technical sciences / Chemical engineering Technical sciences / Fundamental Technical sciences	386	5	581	14			A. Rogina / *In situ* synthesis of hydroxyapatite within biodegradable polymer matrices (2015)	5		1/1
								M. Sekopet Barić / Influence of additives on rheological properties of bitumen in temperature range of application in asphalt	0		
Marija Šindler https://bib.irb.hr/lista-radova?autor=47004	Full professor (retired) Natural sciences / Chemistry		13	855	18			I. Šagud / Synthesis and photochemistry of styrene-oxazoles, formation of new heteropolycyclic compounds (2014)	4		1/0
Marija Vuković Domanovac https://bib.irb.hr/lista-radova?autor=250011	Associate professor Technical sciences / Chemical engineering	410.7	10	149	6			I. Ćosić / Aerobic treatmant of leachate from tobacco waste (2015)	6		1/0
Marijana Hranjec https://bib.irb.hr/lista-radova?autor=245291	Associate professor Natural sciences / Chemistry	355	11	394	12			M. Aleksić / Synthesis, photochemical synthesis, QSAR analysis and antitumor activity of novel derivatives of benzothieno- and thienothieno-quinolones (2013)	2		3/0
								M. Popović / Identification of carbonylated proteins in different stages of colorectal cancer (2016)	1		
								N. Perin / Synthesis and biological activity of novel amino substituted benzimidazo[1,2-*a*]quinolines (2014)	4		
Marin Hraste https://bib.irb.hr/lista-radova?autor=16553	Academician Professor emeritus Technical sciences / Chemical engineering		3	35	3			Z. Knežević / Development of hot melt coating process for designing a controlled release drug delivery system (2013)	1		1/0
Marjan Tušar National Institute of Chemistry Slovenia https://www.researchgate.net/profile/Marjan_Tusar/publications	Research Associate Natural sciences / Chemistry		5	159	7			M. Sekopet Barić / Influence of additives on rheological properties of bitumen in temperature range of application in asphalt	0		0/1

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Marko Rogošić https://bib.irb.hr/lista-radova?autor=189535	Full professor Technical sciences / Chemical engineering	459	9	234	9			K. Premec / Theoretical aspects of sustainable water and energy production by solar energy	0		0/2
								T. Strahovnik / Development of artificial neural network prediction model of greenhouse gas emissions based on sectoral energy consumption in Croatia	0		
Matthew Steinberg Go Sense Wireless Ltd London, UK	Technical sciences / Electrical engineering		7	139	7			P. Kassal / Development of novel chemical sensors for emerging mobile wireless applications (Razvoj novih kemijskih senzora za nadolazeće mobilne bežične primjene) (2015)	5		1/0
Mila Radan University of Split Faculty of Chemistry and Technology https://bib.irb.hr/lista-radova?autor=247111	Assistant professor Natural sciences / Chemistry	267	2	664	9			F. Burčul / Acetylcholinesterase inhibition and antioxidative activity of essential oils from selected plants of Ranunculaceae family (2014)	8		1/0
Milan Sak-Bosnar Josip Juraj Strosssmayer University in Osijek Department of Chemistry https://bib.irb.hr/lista-radova?autor=130381	Full professor Natural sciences / Chemistry	-	24	332	11			M. Jozanović / Electroanalytical characterization and electrophoretic determination of histidine dipeptides, carnosine and anserine using C^4D detector (2015)	5		3/0
								M. Samardžić / Simultaneous potentiometric determination of cationic and ethoxylated nonionic surfactants in real systems by using surfactant sensor (2011)	11		
								N. Sakač / A new potentiometric amylase sensor (2011)	12		
Miljenko Dumić Pliva, Research & Development https://bib.irb.hr/lista-radova?autor=133202	Research counsellor (retired) Natural sciences / Chemistry		3	344	12			M. Žegarac / Solid state forms of model substances and selected active pharmaceutical ingredients screening and characterization – perspectives and limitations (2014)	1		1/0

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Mira Ristić Ruđer Bošković Institute Division of Materials Chemistry https://bib.irb.hr/lista-radova?autor=85111	Research counsellor Natural sciences / Chemistry		39	1720	23			J. Štajdohar / Precipitation of iron oxyhydroxides and oxides from aqueous solutions of Fe^{3+} ions with various addings (2014)	3		2/0
								I. Opačak / Dependence of nano/microstructural properties of iron oxides on the chemical synthesis conditions (2015)	3		
Mirela Leskovac https://bib.irb.hr/lista-radova?autor=175223	Full professor Technical sciences / Chemical engineering	521.8	9	220	8			M. Mimica-Tkalčec / Impact study of hydrolitic, thermal and UV ageing on the properties of paper for restauration	0		1/2
								P. Hitrec / Optimization of interface properties on polypropylene/polystyrene blends	0		
								D. Vrsaljko / Degradation of transformer solid insulation under laboratory ageing conditions (2013)	1		
Mirela Samardžić Josip Juraj Strosssmayer University in Osijek Department of Chemistry https://bib.irb.hr/lista-radova?autor=297004	Assistant professor Natural sciences / Chemistry	-	11	47	5			O. Galović / Development and construction of a potentiometric surfactant microsensor (2014)	8		1/1
								S. Petrušić / Use of nanomaterials in the construction of surfactant potentiometric sensors	3		
Mirjana Metikoš-Huković https://bib.irb.hr/lista-radova?autor=30602	Professor emeritus Technical sciences / Chemical engineering Natural sciences / Chemistry		24	3246	32			J. Katić / Biocompatibility of nitinol shape memory alloy: Electrochemical and surface characterization (2012)	8		1/0
Miroslav Bajić University of Zagreb Faculty of Veterinary Medicine https://bib.irb.hr/lista-radova?autor=1543	Full professor Natural sciences / Chemistry	-	13	618	12			L. Krstulović / N-sulfonylamidines in pyrimidine series, synthesis and antitumor activity (2012)	5		1/0

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Mladen Mintas https://bib.irb.hr/lista-radova?autor=31831	Full professor (retired) Natural sciences / Chemistry		9	1083	20			M. Stipković Babić / Synthesis and biological evaluation of new halogenated derivatives of deazapurines and L-ascorbic acid (2014)	3		2/0
								K. Benci / Synthesis, antiviral and antitumor activity evaluations of new acyclic 1,2,4-triazole, pyrimidine and purine nucleoside analogues (2013)	3		
Muhamed Sućeska Brodarski institute, Zagreb https://bib.irb.hr/lista-radova?autor=186903	Research counsellor Technical sciences / Chemical engineering		15	389	10			S. Matečić Mušanić / Mechanism and kinetics of the aging process of double base rocket propellants, and the possibilities for life-time assessment (2011)	2		1/0
Natalija Koprivanac https://bib.irb.hr/lista-radova?autor=22030	Professor emeritus Technical sciences / Chemical engineering		24	1725	23			I. Grčić / Modelling of the photocatalytic and sonochemical process for the wastewater treatment (2011)	11		1/1
								I. Cindrić / Photocatalysis of organic compounds by titanium dioxide modified with dyes and pigments	0		
Nedjeljko Perić University of Zagreb Faculty of Electrical Engineering and Computing https://bib.irb.hr/lista-radova?autor=68011	Full professor Technical sciences / Electrical engineering Technical sciences / Fundamental Technical sciences	-	8	369	11			V. Hocenski / Novel approach towards reducing the environmental impact of ceramic industry based on neural networks (2012)	1		1/0

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Nenad Bolf https://bib.irb.hr/lista-radova?autor=220561	Professor Technical sciences / Chemical engineering	531	5	70	5			S. Borković / Development of advanced process control for gasoline distillation end point estimation	0		2/3
								I. Mohler / Development of soft sensors for refinery advanced process control (2015)	4		
								B. Ribić / Development of model for estimation of municipal waste generation using neural networks	1		
								Z. Jelašić / Soft sensor model optimisation for advanced refinery process control based on laboratory assays	0		
								Ž. Ujević Andrijić / Soft sensors for nonlinear processes identification and control (2012)	5		
Nikola Basarić Ruđer Bošković Institute Divison of Organic Chemistry and Biochemistry https://bib.irb.hr/lista-radova?autor=250000	Research counsellor Natural sciences / Chemistry		34	1106	17			V. Blažek / Synthesis and spectroscopic characterization of adamantyl-urea receptors, potential anion sensors (2013)	6		1/1
								D. Bobinac / Hydroxybenzyl alcohol derivatives as photoremovable protective groups	2		
Nina Bilandžić Croatian Veterinary Institute https://bib.irb.hr/lista-radova?autor=230005	Research counsellor Natural sciences / Chemistry		46	357	12			M. Đokić / Determination of essential elements in tissues of toothed whales (Odontoceti) from the Adriatic Sea	25		0/1
Predrag Novak University of Zagreb Faculty of Science https://bib.irb.hr/lista-radova?autor=176404	Full professor Natural sciences / Chemistry	-	19	612	13			J. Parlov Vuković / Structural characterization of diesel and fuels using NMR spectroscopy (2011)	10		1/0

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Sandra Babić https://bib.irb.hr/lista-radova?autor=224150	Full professor Natural sciences / Chemistry	312.5	20	736	13			M. Ivešić / Development of chromatographic methods for determination of antibiotics in food samples (2014)	1		5/1
								M. Nestić / Development of modern sample preparation methods for chromatographic determination of cannabinoids in biological samples (2014)	1		
								M. Zrnčić / Development and optimization of analytical protocols for pharmaceuticals determination in wastewaters (2013)	4		
								M. Periša / Chromatographic determination of pharmaceuticals photodegradation products in the environment (2015)	8		
								R. Čalić / Influence of internal standards on determination of volatile and semivolatile analytes by gas chromatography – mass spectrometry	0		
								M. Veršić Bratinčević / Drugs of abuse in biological samples: determination and stability (2015)	3		
Sanja Lučić Blagojević https://bib.irb.hr/lista-radova?autor=186655	Full professor Technical sciences / Chemical engineering	396.25	5	188	9			Z. Buhin Šturlić / Emulsion *in situ* polymerization and characterization of poly(butyl acrylate-*co*-methyl methacrylate)/silica nanosystems (2013)	3		1/1
								L. Babić / Natural hide tanning process with triazine derivate	0		

Teacher (first and last name/institution*) link to CROSBI**	**Research (or academic) rank and field/academic area of election**	**Workload (normed hours)**[a.b.c,d]	**A**	**B**	**C**	**D**	**E**	**Doctoral student / Dissertation title (Year of defence)**	**F**	**G**	**Number of doctoral candidates who defended their thesis/Number of doctoral candidates who did not defend their thesis before the deadline**[e]
Sanja Martinez https://bib.irb.hr/lista-radova?autor=205994	Full professor Technical sciences / Chemical engineering	320	3	1005	15			G. Pustaj / Investigation of steels' corrosion in oil industry and their protection by olive leaf extract (2014)	1		2/2
								A. Ivanković / TiO_2 based nanostructured coatings for corrosion protection (2016)	1		
								K. Kekez / Development of cost effective strategy for pipeline integrity assessment by using of non-invasive measurement techniques	0		
								Z. Čeralinac / Impact of SiC and TiO_2 nanoparticles on corrosion and tribological properties of nanocomposite nickel coating	0		
Sanja Papić https://bib.irb.hr/lista-radova?autor=1760	Full professor Technical sciences / Chemical engineering	545	9	566	11			B. Plavac / Development of advanced photocatalytic processes for degradation of aromatic pollutants in water	0		1/1
								B. Skoko / Radiological impact of waste from coal-fired power plant on the environment (2014)	3		
Silvana Raić-Malić https://bib.irb.hr/lista-radova?autor=203323	Full professor Natural sciences / Chemistry	395	17	541	14			B. Borovička / Isolation and structural characterization of novel polyketides, anthrone derivatives obtained via biosynthesis (2012)	1		3/1
								A. Meščić / Synthesis of novel acyclic pyrimidine nucleoside analogues with potential application in positron emission tomography (2014)	7		
								S. Maračić / 1,2,3-triazole and heterocycle conjugates: synthesis, antimicrobial and cytostatic evaluations	3		
								S. Jurmanović / *In* vitro ADME properties characterization of macrolide steroide conjugates as a new class of anti-inflammatory drug research (2011)	2		

Teacher (first and last name/institution*) link to CROSBI**	Research (or academic) rank and field/academic area of election	Workload (normed hours)[a.b.c.d]	A	B	C	D	E	Doctoral student / Dissertation title (Year of defence)	F	G	Number of doctoral candidates who defended their thesis/Number of doctoral candidates who did not defend their thesis before the deadline[e]
Slobodan Brinić University of Split Faculty of Chemistry and Technology https://bib.irb.hr/lista-radova?autor=181051	Associate professor Natural sciences / Chemistry	322.5	12	265	9			N. Vladislavić / Development of bismuth film-electrodes for determination of organic compounds in aqueous medium (2014)	3		1/0
Stanislav Kurajica https://bib.irb.hr/lista-radova?autor=186666	Full professor Technical sciences / Chemical engineering Technical sciences / Fundamental Technical sciences	482.5	15	497	13			V. Mandić / Sol-gel synthesis and characterization of lanthanum doped mullite (2012)	15		3/1
								I. Minga (Lozić) / The preparation of nanocrystalline anatase from modified alkoxide (2016)	2		
								I. Simčić / The preparation of γ-Al_2O_3 out of aluminium *sec*-butoxide modified with ethyl acetoacetate in various ratios	1		
								T. Očko / Sol-gel synthesis and characterization of ZnO-TiO_2-Al_2O_3 ceramics	2		
Stanka Zrnčević https://bib.irb.hr/lista-radova?autor=55196	Full professor (retired) Technical sciences / Chemical engineering		7	243	8			Z. Mastelić Samardžić / Catalytic hydrogenation in process of donepezil hydrochloride synthesis (2013)	3		3/0
								O. Wittine / Process intensification in phenolic wastewater treatment (2013)	2		
								I. Šoštarić / Homogeneous catalytic asymmetric reduction of enamine (2013)	1		

Teacher (first and last name/institution*) link to CROSBI**	Research (or academic) rank and field/academic area of election	Workload (normed hours)[a.b.c.d]	A	B	C	D	E	Doctoral student / Dissertation title (Year of defence)	F	G	Number of doctoral candidates who defended their thesis/Number of doctoral candidates who did not defend their thesis before the deadline[e]
Stjepan Milardović https://bib.irb.hr/lista-radova?autor=154444	Associate professor Natural sciences / Chemistry	362	6	347	11			A. Prkić / Development of spectrophotometric and potentiometric methods for thiols determination (2013)	13		7/1
								M. Samardžić / Simultaneous potentiometric determination of cationic and ethoxylated nonionic surfactants in real systems by using surfactant sensor (2011)	11		
								O. Galović / Development and construction of a potentiometric surfactant microsensor (2014)	8		
								S. Petrušić / Use of nanomaterials in the construction of surfactant potentiometric sensors	3		
								N. Vladislavić / Development of bismuth film-electrodes for determination of organic compounds in aqueous medium (2014)	3		
								M. Palčić / Development of sensory and chemometric methods for selective determination of various analytes in food (2015)	2		
								M. Nodilo / Development of rapid methods for the determination of ^{55}Fe, ^{89,90}Sr and some alpha emitters in complex samples (2014)	4		
								N. Sakač / A new potentiometric amylase sensor (2011)	12		
Štefica Cerjan-Stefanović https://bib.irb.hr/lista-radova?autor=6631	Full professor (retired) Natural sciences / Chemistry		4	929	14			M. Luša / Advanced methods for ion chromatographic system optimization in anion analysis (2011)	1		2/0
								D. Doležal / Development of methods for determination of corrosion inhibitors efficiency in oilfield brines (2011)	2		

Teacher (first and last name/institution*) link to CROSBI**	**Research (or academic) rank and field/academic area of election**	**Workload (normed hours)**[a.b.c,d]	**A**	**B**	**C**	**D**	**E**	**Doctoral student / Dissertation title (Year of defence)**	**F**	**G**	**Number of doctoral candidates who defended their thesis/Number of doctoral candidates who did not defend their thesis before the deadline**[e]
Tomislav Rolich University of Zagreb Faculty of Textile Technology https://bib.irb.hr/lista-radova?autor=232766	Associate professor Technical sciences / Computing sciences	652.5	4	48	4			Z. Jelašić / Soft sensor model optimisation for advanced refinery process control based on laboratory assays	0		1/1
								Ž. Ujević Andrijić / Soft sensors for nonlinear processes identification and control (2012)	5		
Vladimir Dananić https://bib.irb.hr/lista-radova?autor=120953	Associate professor Natural sciences / Physics	405	4	156	8			E. Dražević / Transport of nonionized organics through reverse osmosis and nanofiltration membranes (2014)	7		1/0
Vesna Alar University of Zagreb Faculty of Mechanical Engineering and Naval Architecture https://bib.irb.hr/lista-radova?autor=187083	Associate professor Technical sciences / Engineering	464	14	53	5			Z. Čeralinac / Impact of SiC and TiO_2 nanoparticles on corrosion and tribological properties of nanocomposite nickel coating	0		0/1
Vesna Gabelica Marković Fidelta d.o.o. Zagreb https://bib.irb.hr/lista-radova?autor=138402	Research Associate Natural sciences / Chemistry		4	191	8			S. Jurmanović / *In* vitro ADME properties characterization of macrolide steroide conjugates as a new class of anti-inflammatory drug research (2011)	2		1/0
Vesna Rek https://bib.irb.hr/lista-radova?autor=40741	Full professor (retired) Technical sciences / Chemical engineering		9	275	9			V. Ocelić Bulatović / Rheological properties of polymer modified bitumen (2013)	6		1/0
Vesna Tomašić https://bib.irb.hr/lista-radova?autor=179216	Full professor Technical sciences / Chemical engineering	282.5	7	223	7			I. Jakovljević / Spatial and temporal distribution of polycyclic aromatic hydrocarbons in the air	3		1/2
								M. Duplančić / Catalytic oxidation of toluene in metal monolith reactor	0		
								J. Le Cunff / Heterogeneous photocatalytic degradation of herbicides in leachate and wastewater (2016)	1		

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Tomislav Bolanča https://bib.irb.hr/lista-radova?autor=233894	Full professor Natural sciences / Chemistry	305	21	269	9			S. Marinović / Prediction of diesel fuels properties by vibration spectroscopy using multivariate analysis and artificial neural network (2011)	3		6/4
								Z. Buić / Application of bentonite clay for petrochemical wastewater pretreatment (2013)	1		
								D. Matijašec / Adsorption processes for the removal of aluminium, arsenic and vanadium from wastewaters	0		
								M. Novak Stankov / Molecular modeling and artificial intelligence in development of ion chromatographic methods (2015)	9		
								I. Tomiek / Spatial distribution of anthropogenic contaminants in river Bednja	0		
								M. Buljac / Spatial and temporal anthropogenic element distribution in Kaštela bay sediment (2012)	8		
								S. Radojević Lacković / Disposal of sludge originated from municipal waste water treatment by immobilization into construction ceramics (2015)	1		
								D. Doležal / Development of methods for determination of corrosion inhibitors efficiency in oilfield brines (2011)	2		
								M. Đokić / Determination of essential elements in tissues of toothed whales (Odontoceti) from the Adriatic Sea	25		
								T. Strahovnik / Development of artificial neural network prediction model of greenhouse gas emissions based on sectoral energy consumption in Croatia	0		

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Višnja Horvat Radošević Ruđer Bošković Institute https://bib.irb.hr/lista-radova?autor=16202	Research counsellor (retired) Natural sciences / Chemistry		4	228	9			K. Magdić / Electrochemical impedance spectroscopy in characterization of non-modified and electrochemically modified carbon electrodes (2014)	6		1/0
Zlata Hrnjak-Murgić https://bib.irb.hr/lista-radova?autor=120683	Full professor Technical sciences / Chemical engineering	340	19	145	7			A. Rešček / Active food packaging based on modified polyethylene nanocomposite films (2014)	2		3/0
								N. Dimitrov / Study of contaminant levels in recycled poly(ethylene-terephthalate) (2014)	1		
								Z. Katančić / Effect of modified nanofillers on thermal stability of polystyrene nanocomposites (2013)	9		
Zoran Mandić https://bib.irb.hr/lista-radova?autor=160011	Professor Technical sciences / Chemical engineering	265	5	806	13			M. Jozanović / Electroanalytical characterization and electrophoretic determination of histidine dipeptides, carnosine and anserine using C^4D detector (2015)	5		3/0
								S. Sopčić / Composites of polymers and metal oxides as electrode materials in electrochemical supercapacitors (2014)	4		
								K. Magdić / Electrochemical impedance spectroscopy in characterization of non-modified and electrochemically modified carbon electrodes (2014)	6		
Zorana Grabarić University of Zagreb Faculty of Food Technology and Biotechnology https://bib.irb.hr/lista-radova?autor=14053	Full professor (retired) Natural sciences / Chemistry		5	466	12			M. Palčić / Development of sensory and chemometric methods for selective determination of various analytes in food (2015)	2		1/0
Zvjezdana Findrik Blažević https://bib.irb.hr/lista-radova?autor=252884	Associate professor Technical sciences / Chemical engineering	346.25	14	207	8			D. Čelig / Biocatalytic degradation of herbicides in water	0		1/1
								M. Sudar / Biocatalytic synthesis of an aldol product, a precursor of D-fagomine (2015)	6		

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Zvonimir Glasnović https://bib.irb.hr/lista-radova?autor=240100	Associate professor Technical sciences / Electrical engineering	435	8	123	6			M. Sesartić / Modelling the process of heat and mass transfer in complex thermal bridges	0		0/2
								K. Premec / Theoretical aspects of sustainable water and energy production by solar energy	0		
Željko Grahek Ruđer Bošković Institute Division for Marine and Environmental Research https://bib.irb.hr/lista-radova?autor=159883	Research Associate Natural sciences / Chemistry		5	193	9			M. Nodilo / Development of rapid methods for the determination of ^{55}Fe, ^{89,90}Sr and some alpha emitters in complex samples (2014)	4		1/1
								I. Coha / Rapid determination of ^{89,90}Sr in complex samples by Cherenkov counting on chromatographic column	1		
Krunoslav Žižek https://bib.irb.hr/lista-radova?autor=252296	Assistant professor Technical sciences / Chemical engineering	500.25	5	34	3			R. Pavlina / Formulation of an agricultural substance using fluid-bed spray granulation	0		0/1
Davorka Sutlović University of Split School of Medicine http://bib.irb.hr/lista-radova?autor=256403	Full professor Biomedical sciences / Medicine	-	10	314	10			M. Veršić Bratinčević / Drugs of abuse in biological samples: determination and stability (2015)	3		2/0
								M. Nestić / Development of modern sample preparation methods for chromatographic determination of cannabinoids in biological samples (2014)	1		
Zdenko Šmit Andrija Štampar Teaching Institute of Public Health http://bib.irb.hr/lista-radova?autor=76403	Research counsellor Biotechnical sciences / Biotechnology		3	155	6			M. Ivešić / Development of chromatographic methods for determination of antibiotics in food samples (2014)	1		1/0

[a] For the teachers of the Faculty – Teaching workload in the doctoral programme of study – Course is executed depending on the interest

[b] For the teachers of the Faculty – Working load – 1st and 2nd Bologna cycle is for academic year 2015/16.

[c] For the teachers of the Faculty – Working load at other institutions is for academic year 2014/15.

[d] For the teachers coming from other faculties – Teaching workload read from the self-evaluation reports: for the Faculty of Chemistry and Technology of the University of Split for academic year 2013/14, for the Faculty of Agriculture of the Josip Juraj Strossmayer University in Osijek for academic year 2010/11, for the Faculty of Education of the Josip Juraj Strossmayer University in Osijek for academic year 2012/13, for the Faculty of Mechanical Engineering and Naval Architecture of the University of Zagreb for academic year 2009/10, for the Faculty of Textile Technology of the University of Zagreb for academic year 2013/14.

A = number of relevant journal articles published from 1 January 2011 to 31 December 2015 according to WoS database.

B = number of citations according to WoS database for the lifetime research activity of the teacher.
C = *h*-index according to WoS database for the lifetime research activity of the teacher.
D = number of leaderships and/or collaborations in international research projects in the last five years (irrelevant).
E = number of leaderships and/or collaborations in national research projects in the last five years (irrelevant).
F = number of journal articles originating from the doctoral research according to WoS database (as presented in the Annual Self-Evaluation Report of the Faculty 2016).
G = number of citations of those articles, if applicable (irrelevant, due to the short citation period).
[e] Number of doctoral candidates who defended their thesis and number of doctoral candidates who did not defend their thesis is shown, regardless of the deadline.
Orange colour marks the data irrelevant for the self-evaluation of the doctoral programme of study under analysis.

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