

REPORT of the Expert Panel on the

RE-ACCREDITATION OF **E** Faculty of Chemical Engineering and Technology University of Zagreb

Date of the site visit: 23 - 24 March 2015

April, 2015

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INTRODUCTION

This report on the re-accreditation of the Faculty of Chemical Engineering and Technology of the University of Zagreb was written by the Expert Panel appointed by the Agency for Science and Higher Education, on the basis of the self-evaluation of the institution, the supporting documentation and a visit to the institution.

The re-accreditation procedure performed by the Agency for Science and Higher Education (ASHE), a public body listed in EQAR (*European Quality Assurance Register for Higher Education*) and a full member of ENQA (*European Association for Quality Assurance in Higher Education*), is obligatory once in five years for all higher education institutions working in the Republic of Croatia, in line with the Act on Quality Assurance in Higher Education.

The Expert Panel is appointed by the ASHE Accreditation Council, an independent expert body, to perform an independent peer-review-based evaluation of the institution and their study programmes.

The report contains:

- a brief analysis of the institutional advantages and disadvantages,
- a list of good practices found at the institution,
- recommendations for institutional improvement and measures to be implemented in the following period (and checked within a follow-up procedure), and
- detailed analysis of the compliance to the Standards and Criteria for Re-Accreditation.

The members of the expert panel were:

- professor Kai-Olaf Hinrichsen, Technische Universitat Munchen, Federal Republic of Germany (chair)
- professor Jan Roda, Institute of Chemical Technology, Prague, Faculty of Chemical Technology, Department of Polymers, Czech Republic
- professor Mojca Škerget, Faculty of Chemistry and Chemical Engineering, University of Maribor, Republic of Slovenia
- doc. dr. sc. Stjepan Orhanović, Faculty of Science University of Split, Republic of Croatia
- Milenko Korica, student, Department of Chemistry, Josip Juraj Strossmayer University of Osijek, Republic of Croatia.

In the analysis of the documentation, site visit and writing of the report the Panel was supported by:

- Katarina Šimić Jagunić, coordinator, Agency for Science and Higher Education
- Emita Blagdan, support to the coordinator, Agency for Science and Higher Education
- Lida Lamza, interpreter at the site visit and report translator, Agency for Science and Higher Education.

During the visit to the Institution the Expert Panel held meetings with the representatives of the following groups:

- The Management
- The Working Group that compiled the Self-Evaluation
- The Quality Assurance Board as well as the representative for international cooperation
- Heads of departments, teachers, teaching assistants, leaders of scientific projects
- The students
- Administrative staff.

The Expert Panel also had a tour of the laboratories, library, IT rooms, student register desk, and the classrooms at the Faculty of Chemical Engineering and Technology University of Zagreb, where they held a brief question and answer session with the students who were present.

Upon the completion of the re-accreditation procedure, the Accreditation Council renders its opinion on the basis of this Re-accreditation Report, the Assessment of Quality of the higher education institution and the Report of Fulfilment of Quantitative Criteria acquired from the Agency's information system.

Once the Accreditation Council renders its opinion, the Agency issues an Accreditation Recommendation by which the Agency recommends to the Minister of Science, Education and Sports to:

1. **issue a confirmation on compliance** with the requirements for performing higher education activities or parts of activities (renew the licence),

2. **deny the license** for performing the higher education activities or parts of activities to the higher education institution, or

3. **issue a letter of recommendation** for the period up to three (3) years in which period the higher education institution should make the necessary improvements. The letter of recommendation may include suspension of student enrolment for the defined period.

The Accreditation Recommendation also includes an Assessment of Quality of the higher education institution as well as recommendations for quality development.

SHORT DESCRIPTION OF THE EVALUATED INSTITUTION

NAME OF HIGHER EDUCATION INSTITUTION: Faculty of Chemical Engineering and Technology University of Zagreb

ADDRESS: Marulićev trg 19 and 20 and Savska cesta 16, Zagreb

NAME OF THE HEAD OF HIGHER EDUCATION INSTITUTION: prof. dr. sc. Bruno Zelić

ORGANISATIONAL STRUCTURE:

The Dean and the Faculty Council constitute the Managing Bodies of the Faculty.

Departments, Chairs, the Library and Information Centre and the Secretariat are the Organisational Units of the Faculty. The Faculty Departments and the Chairs are organised in compliance with the teaching and scientific and research activity of the Faculty. The Department/Chair is managed by the Head.

The Library and Information Centre (BIC - *Bibliotečno-informacijski centar*) is an organisational unit and the central library of the Faculty headed by the senior librarian.

The Secretariat of the Faculty is an organisational unit in charge of joint administrative, general and auxiliary affairs of the Faculty. The Secretariat is run by the Secretary. The Secretariat is comprised of: the Dean's Office, Office of Administrative and General Affairs, Office of Material Transactions and Financial Management and Technical and Auxiliary Offices.

LIST OF STUDY PROGRAMMES (and levels):

- undergraduate and graduate programmes of study Chemical Engineering, Materials Chemistry and Engineering, Environmental Engineering, and Applied Chemistry
- postgraduate doctoral programme of study Chemical Engineering and Applied Chemistry
- postgraduate specialist programme of study Petroleum and Petrochemical Engineering.

The Faculty is a coordinator of two interdisciplinary postgraduate specialist university programmes of study:

- Environmental Engineering Faculty participating in the execution of instruction together with another 12 institutions (of which eight components of the University of Zagreb)
- Corrosion and Protection (also as a participant in the execution of instruction together with another four components of the University of Zagreb).

The Faculty also takes part in the execution of instruction in the interdisciplinary postgraduate specialist university programme of study Crisis Management (together with another 12 components of the University of Zagreb).

NUMBER OF STUDENTS

- full-time students in undergraduate and graduate study programmes/academic year 2013/2014: 989
- students in postgraduate doctoral programme of study/academic year 2013/2014 30

NUMBER OF TEACHERS:

- full-time 60
- external associates 7

NUMBER OF SCIENTISTS: 57

TOTAL BUDGET (2013): 42,302,577.00 kn

MSES FUNDING (percentage): 84.03%

OWN FUNDING (percentage): 15.97%

SHORT DESCRIPTION OF HIGHER EDUCATION INSTITUTION:

The roots of the Faculty of Chemical Engineering and Technology date back to 1919, when the Technical Institute was founded in Zagreb with the aim of "providing comprehensive theoretical, but also practical education as much as possible for such technical ranks, the professions of which are represented in this institute".

In 1926 the Technical Institute became the Technical Faculty of the University of Zagreb, (with Chemical Engineering Department as its constituent part) allowing teachers and associates a more intensive scientific activity.

Following the restructuring of the Technical Faculty in 1956, the Chemical Technology programme of study was taught at the Faculty of Chemical, Food and Mining Technology, and from 1957 within the newly-founded Faculty of Technology. In that period it became a core wherefrom new faculties were established. In 1978 the Faculty of Metallurgy and in 1980 the Faculty of Food Science and Biotechnology became separate faculties, and finally when on 16 November 1991 the Faculty of Technology split into the Faculty of Chemical Engineering and Technology and the Faculty of Textile Technology, the long lasting wish of the Faculty to become independent came true.

From its foundation until now the Faculty has paid undivided attention to the education of scientific, research-oriented and professional young generations in the academic areas of chemistry and chemical engineering, the mutually intertwined and complementary disciplines. Following the introduction of the Bologna model of higher education in 2005, four

undergraduate and four graduate programmes of study were proposed and adopted as a result of a respectable scientific activity in the academic areas of chemistry, chemical engineering, fundamental technical sciences and interdisciplinary technical sciences: Chemical Engineering, Environmental Engineering and Materials Chemistry and Engineering in the field of technical sciences and Applied Chemistry in the field of natural sciences. Today the Faculty is licensed to conduct the elections to research and academic ranks in the field of natural sciences (academic area of chemistry), and in the field of technical sciences (academic areas of chemical engineering and fundamental technical sciences).

The abundant scientific activity of the Faculty teachers was a foundation to initiate the postgraduate programmes of study of great importance. Following the introduction of the Bologna model in 2005, the postgraduate doctoral programmes of study were introduced as follows: Engineering Chemistry in the field of natural sciences, academic area of chemistry and technical sciences, academic area of other fundamental technical sciences and Chemical Engineering in the field of technical sciences, academic area of chemical engineering. In the academic year 2013/2014, the Faculty, encouraged by the University of Zagreb, integrated the doctoral programmes of study: Engineering Chemistry and Chemical Engineering as the first one at the University.

In the academic year 2013/2014 the Faculty was granted the licence by University of Zagreb for the specialist university programme of study Petroleum and Petrochemical Engineering initiated in accordance with the interest expressed by and in agreement with the Croatian petroleum and petrochemical industry.

Furthermore, the Faculty is a coordinator of the postgraduate specialist university programmes of study: Environmental Engineering and Corrosion and Protection.

CONCLUSIONS OF THE EXPERT PANEL

ADVANTAGES OF THE INSTITUTION

- 1. Clear vision and strategy for the restructuring the Faculty.
- 2. Clear overall vision and strategy in study programmes.
- 3. High reputation, not only in Croatia.
- 4. Good networking and good contacts to industry.
- 5. Good employment rate.

DISADVANTAGES OF THE INSTITUTION

- 1. Dislocation of the departments within three buildings at different locations in the city
- 2. Old teaching and research laboratory facilities, which are used to their maximal capacity
- 3. Imposing more stringent criteria for elections than demanded by the law that ensures high quality research and teaching.
- 4. Not enough financial support from government (based on the economic situation in Croatia).

FEATURES OF GOOD PRACTICE

- 1. Good monitoring of follow-up of graduate students' career, maintaining contact with them on mutual benefit, active alumni.
- 2. Good interaction with industry sector.
- 3. Mechanisms for monitoring unethical behaviour in teaching and research are well developed and applied through the whole system of teaching and research. HEI encourages excellence of its employees, including a reward system based on scientific productivity.

RECOMMENDATIONS FOR IMPROVEMENT

- 1. Management of the Higher Education Institution and Quality Assurance
 - Better alignment between strategic documents of the University of Zagreb and HEI as well as operational cooperation on many issues of mutual interest could bring benefits to all parties.

2. Study Programmes

- HEI has defined its strategic goals in each of the seven areas of the self-evaluation process. With respect to study programmes, the formulation of the strategic goal – to analyse and optimise permanently the programmes of study by interacting with all stakeholders of the education system – should <u>not</u> lead to permanently changing the study plans.
- HEI has integrated two doctoral study programmes and created a new study programme "Chemical Engineering and Applied Chemistry". This programme appears

to be very broad and fragmented, covering several fields (branches) of chemistry. Applied chemistry can contain a number of disciplines (it is not clearly defined) as can also be seen in the compulsory courses that pertain to polymers, organic chemistry of the heterocycles, waste water processing, environmental issues, chemistry of the surfaces, etc. Chemical engineering and applied chemistry are in fact not connected.

- It is necessary to point to the impediment that works against quality and quality improvement in study programmes as well as the graduates' knowledge: the official pressure or push to decrease the rate of student drop-out, which directly affects the level of knowledge of applicants and lowers the HE criteria.
- HEI is encouraged to include other stakeholders from the private and public sector in the monitoring procedure.
- While the study courses are characterized by well formulated learning outcomes, the study competences have to be defined more precisely.

3. Students

 Students are generally satisfied with the equipment that is present in students and research laboratories as evidenced during tour and discussions. It is used in accordance with the mission, however, modern equipment is needed.

4. Teachers

- Croatian Government should support this Faculty to maintain the high quality of teachers. Actions comprise the replacement of positions upon retirement of teachers as well as the promotion. The panel strongly encourage the Faculty to switch to a "true" tenure-track system which includes the promotion from (untenured) assistant professor to a tenured associate and finally (after completion of the requirements) to a full professor. Tenure evaluation should be performed by annual performance interviews and assessments (e.g. every three years).
- The Faculty should encourage their teachers to apply for mobility and to take part in mobility programmes.

5. Scientific and Professional Activity

- The Faculty should put more effort in encouraging and motivating academic staff for mobility and international cooperation.
- For improvement of the current situation it is recommended to consider the establishment of funds (e.g. by government, university) that would support funding of EU projects. Furthermore, it is recommended to intensify the collaboration with the business sector.

6. International Cooperation and Mobility

- Mobility should be increased in order to foster collaboration and projects. The panel agrees with the proposals in the self-evaluation (pp. 121).
- Attracting students and teachers from abroad should be improved by increasing the number of English courses, e.g. block teaching by foreign teachers can easily be done.

7. Resources: Administration, Space, Equipment and Finances

- More attention should be paid to professional development of non-teaching staff, including their involvement in new tasks facing the HEI.
- Resources and space on disposal to the HEI are used to their maximal capacity. Further development and achievement of the highest international standards would require an improvement on that matter.

DETAILED ANALYSIS OF INSTITUTIONAL COMPLIANCE TO THE STANDARDS AND CRITERIA FOR RE-ACCREDITATION

1. Management of the Higher Education Institution and Quality Assurance

1.1. HEI developed strategic plan, stakeholders were partly included in the process of strategic plan development. The plan includes strategic objectives, measures, action plan and as a monitoring mechanism annual self-evaluation. Monitoring mechanisms could be better developed.

1.2. As evidenced in self-evaluation report and relevant documents, HEI has developed effective organizational structure and processes and has formalized them in its legal documents. Reorganization plan adopted by Faculty Council seems sound and well suited to HEI mission.

1.3. At the moment, the Croatian version of the University of Zagreb web site contains several strategic documents, mostly close to the final stage of acceptance but not yet finished, while English version hosts only "Research strategy 2008-2013" and "Internationalization strategy 2014 – 2025". Faculty of Chemical Engineering and Technology has Development Strategy 2015 – 2020 adopted by Faculty Council on February 23rd 2015 and Strategic Program of Scientific Research, both document are partly based on Evaluation report of the University of Zagreb and its uncompleted strategic documents available on the date of adoption of Faculty of Chemical Engineering and Technology defined HEI goals are aligned with available University documents. During our visit we learned that constituents of the University of Zagreb are rather loosely integrated. University strategic documents are not yet in their final stage and the quality of communication between HEI and University on strategic level should be improved.

1.4. All four undergraduate, four graduate and two postgraduate (one doctoral and one university specialist) study programmes are in line with proclaimed HEI mission.

1.5. Quality assurance policy with procedures is defined in The Faculty Quality Assurance Manual drafted in February 2015. Quality policy is in line with the Standards and Guidelines for Quality Assurance in the European Higher Education Area.

1.6. Mechanisms for monitoring and improvement of teaching quality on HEI were discussed with management, heads of department and teachers. It is governed by Vice-Dean for Education and it includes student surveys. In cooperation with the University of Zagreb or other specialised institutions or agencies, the Vice-Dean for Education of the Faculty organises, coordinates and ensures professional training and development of general and methodological teachers' competences. According to self-evaluation report the teaching competency is monitored

according to development, publication and availability of teaching materials. Some improvement could result from formalization of present practices.

1.7. Research quality is followed by Vice-Dean for Science, it is tied to elections to academic ranks with criteria on HEI more stringent than minimal criteria demanded by law regulating that matter and exceeding the criteria used by other relevant institutions. HEI body appointed to follow research quality could improve monitoring mechanism.

1.8. Teachers, researchers and other employees of the Faculty have an obligation to act in accordance with moral and ethical principles contained under the Code of Ethics of the University of Zagreb. The Ethical Commission of the Faculty takes care of the achievement and improvement of ethical standards at the Faculty and of the implementation of the Code of Ethics.

2. Study Programmes

2.1. The Faculty has applied the project concerning HE Qualification and Professions Standards with specific objectives: to establish HE standards, to improve the study programmes, to determine learning outcomes and to improve competencies.

A part of the assessment questions cannot be answered in detail because some procedures are still in progress.

Specifically, learning outcomes will be harmonized during the year 2015 according to the evaluation report. In order to make a correct assessment, it would be necessary to know the learning outcomes of study programmes in detail.

Quality is monitored over exit surveys of graduates and on the basis of occasional input of the staff. The self-evaluation process of undergraduate programmes was carried out in this pattern in 2013/2014.

The use of e-learning adds a significant rejuvenation to the learning process.

2.2. The enrolment quotas have been set in accordance with social needs, available premises, previous statistics from similar institutions and statistics obtained from the Croatian Employment Service, and are accepted by the government.

The current enrolment quotas for undergraduate and graduate level studies are adequate because the employment rates of graduates are relatively high (the quotas for graduate study also provide the possibility for Bachelors to continue studying at their home Faculty.

2.3. The enrolment quotas correspond to teaching and research resources of the Faculty, but the quotas are affected by the high drop-out rate in the first year of study (50%). The Faculty has made the effort to improve the situation through an information campaign and mentoring, yet most of the drop-outs have been "parked" at the Faculty and leave at their own request.

2.4. The learning outcomes of individual courses are clearly defined and formulated, but the learning outcomes of study programmes are missing and for now replaced by learning competences.

2.5. The Faculty has done a great job in preparing the learning outcomes of individual courses, but the learning outcomes of study programmes will only be harmonized in 2015. The recommendation is to finish as soon as possible.

2.6. The allocation of ECTS is reasonable, realistic and based on the work of the ECTS Coordinator – some modifications have been made in 2009/2010 and 2013/2014.

2.7. The panel has established that it is not possible to assess whether the study programmes comply with internationally recognized standards and whether they are based on the latest scientific discoveries. Such assessment would require a detailed analysis of publications in each programme/module.

The fundamental and decisive evaluation is actually carried out during peer review of articles that are published in international journals with impact factor. When using only this source of information, the quality of study programmes seems to be very good (see also scientific activity, point 5 of this evaluation).

2.8. The teaching staff use and combine well all the methods of instruction – lectures, e-learning, consultations, seminars, lab exercises, individual lab works (see self-evaluation report - pg. 60).

2.9. Students and teachers have access to relevant learning resources, to scientific and professional literature.

2.10. The internships are compulsory for the undergraduate students. The Faculty helps students to take part in internships and business partnerships – depending on the availability of partners. The project TARGET also covers the development of student internship programmes.

3. Students

3.1. The competencies of applicants evaluated upon admission are aligned with the demands of their future careers.

3.2. Students have good conditions for professional development and receive full support from HEI for their extracurricular activities.

3.3. Every student has the opportunity to contact his/her mentor regarding counselling or to acquire some advices considering his/her professional development. They are motivated to be engaged in student mobility programmes.

3.4. Regarding the knowledge assessment procedures and methods, they are established and published within the study plan and program for every course, and introduced to the students at the introduction lectures. Students can express their opinions and give suggestions for improvement and they can influence the decision-making and problem-solving processes on issues that concern them.

3.5. HEI maintains contact with its former students through an alumni organization (Association of Graduate Engineers and Friends of Chemical and Technological Studies). Employment data are collected and listed.

3.6. HEI has good cooperation with industry. The panel encourage HEI to organize events together with the industry where they can inform the public about the Faculty, regarding its study programmes, learning outcomes, qualifications and employment opportunities.

3.7. Students are organized in a Students Organization. Based on the discussions with the student representatives, the panel concluded that they actively take part in the Faculty Council. Students can express their opinions and give suggestions for improvement; they can also influence the decision-making and problem-solving processes on issues that concern them.

3.8. Anonymous surveys are one of the ways they can give suggestions or critics about some problems. Considering this they always receive feedback on the measures that have been taken on the basis of their opinions and suggestions, as well as the measures that have been taken in order to solve the problems that affect them.

4. Teachers

4.1. This point has been discussed with the Management Board in detail. The institution employs a sufficient number of qualified full-time teachers to ensure the quality and continuity of teaching all study programmes. The Faculty hired also people who obtained their education in a foreign country or did a long-term research stay abroad.

4.2. Due to the economic situation in Croatia and the restricted governmental policy right now, uncertainties are given with respect to the development of human resources.

4.3. Due to the economic situation in Croatia and the restricted governmental policy right now, uncertainties are given with respect to the development of human resources. Nevertheless, the institution maintains an optimal ratio between students and full-time teachers. Upon retirement of a full professor, the Faculty seeks to fill this position by young researchers.

4.4. In general, HEI has developed policies for scientific-teaching staff that ensure their professional development. However, due to the economic situation in Croatia and the restricted governmental policy, promotion of professors cannot be performed at the moment.

Mobility should be more encouraged (cf. 5 and 6).

4.5. Based on discussions with the teachers and the site visit the teachers' workload seems to be distributed fairly and equitably among all ranks of teachers.

4.6. HEI ensures that teaching and research activities of the employed teaching staff are not affected by their external commitments.

5. Scientific and Professional Activity

5.1. HEI has a strategic research agenda, the performance indicators are well defined.

5.2. Based on the discussion with the management, HEI has a clear envision, however, the bad economic situation in Croatia and the infrastructure play an important role in planning and implementing research projects.

5.3. The number and profile of researchers for the implementation of its strategic research agenda are adequate at the moment; however, in the future when the 5-year contracts of scientific novices expire this could be a problem.

5.4. Based on the research projects and collaborations, HEI has an adequate number of peerreviewed scientific publications.

5.5. HEl provides for high quality research by implementing efficient mechanisms for rewarding and sanctioning staff, promotion into leadership positions and other policies based on excellence, quality research and its impact on society.

5.6. HEI has an adequate number of peer-reviewed scientific publications.

5.7. The number of national and international research projects in the period from 2007 to 2014 is adequate, but most projects have ended or will end in 2015. The number of new (active) national and international projects is relatively small, (1 EU project and some few national projects). Partly this is a consequence of the economic situation and the governmental policy that does not support the funding of the EU projects.

5.8. HEI encourages technology transfer, and cooperation with the industry. Note on the general situation: based on the discussion with the management, HEI encourages technology transfer and cooperation with the industry, however, the bad economic situation in Croatia plays an important role in implementing this tasks.

5.9. The task is mostly implemented. Note on the general situation: HEI supports professional activities, however, the bad economic situation in Croatia plays an important role in implementing this task.

5.10. HEI carries out a high-quality doctoral program with an adequate number and profile of mentors resulting in quality dissertations. Research done by the doctoral students is supported and high quality theses are utilized in other aspects of institution's activities (e.g. researchers and students at the institution benefit from them). Doctoral students are actively involved in research at the institution, and the institution ensures that they complete their doctoral studies within a set time period, equipped with necessary skills.

6. International Cooperation and Mobility

6.1. The institution enables and facilitates mobility of students from other higher education institutions, but the number of incoming and outgoing students is quite small.

6.2. Students have opportunities to complete a part of their programme abroad.; in particular, there is an increasing number of signed Erasmus contracts.

6.3. As stated in the self-evaluation, the involvement in EU projects should be increased.

6.4. Professors from HEI are members in international associations, in particular, in the European Federation of Chemical Engineers (EFCE). Activity in these working parties can be increased in order to foster international collaboration, EU projects and mobility.

6.5. As stated in the self-evaluation, there exist a low incoming and outgoing mobility. The panel agrees on the planned actions, i.e. to increase the number of courses available in English and to enhance the willingness of teachers to receive students for internship and graduation theses. A list should be made of small projects available for internship and graduation theses.

6.6. The Faculty practically does not have any long-term visits of foreign teachers.

6.7. Higher education institution has developed other forms of inter-institutional cooperation through Erasmus and other European projects, bilateral agreements, joint programmes, etc.

7. Resources: Administration, Space, Equipment and Finances

7.1. Appropriate learning capabilities of HEI were assessed during tour through buildings and discussed with employees and students. Necessary learning resources are present and they fulfil

institution mission although organization of learning process and research in the old building have already reach their limits.

7.2. Higher than optimal number of non-teaching staff is present, in particular, in the accounting services. Excess of non-teaching staff could be used more efficiently.

7.3. Not enough efforts has been put to ensure professional development of non-teaching staff, in particular, in terms of their education for new and emerging tasks of administrative support of competitive scientific project proposal and follow up.

7.4. Following comment on point 7.1., laboratory equipment fulfils its task, but due to limitations imposed by present premises it can be stated that it only partly complies with recognized international standards.

7.5. Project leaders, teaching staff and students are generally satisfied with the teaching and research equipment that is present in teaching and research laboratories as evidenced during tour and discussions. It is used in accordance with mission, yet there is still room for improvement in acquiring modern equipment.

7.6. Size of the library and availability of teaching materials are adequate with some improvement possible, most likely in the new premises.

7.7. Financial sustainability is ensured, with own and Ministry of Education Science and Sport funding transparently spent. More funding in particular from sources other than Ministry would be welcome.

7.8. Institution's own funds are used largely to raise the quality of teaching and research.

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