RE-ACCREDITATION OF THE FACULTY OF MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE OF THE UNIVERSITY OF ZAGREB

Date of the site visit:

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COMPOSITION OF THE EXPERT PANEL

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- Prof. Peter W. Gold, Ph.D. until 2007 Institute for Machine Elements and Machine Design of RWTH Aachen University
- Prof. Vladimir Medica, Ph.D., Faculty of Engineering, University of Rijeka
- Prof. Željan Lozina Ph.D., Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split
- Frano Boko - Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split

Expert panel was supported by:

- Irena Petrušić, coordinator, Agency for Science and Higher Education
- Valentina Šimunec, prof., interpreter at the site visit
- Đurđica Dragojević, report translator, Agency for Science and Higher Education

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INTRODUCTION

Short description of the evaluated institution

The Faculty of Mechanical Engineering and Naval Architecture (abbreviated: FSB) was set up after the division of the Technical Faculty into independent faculties based on specialized areas of activity. In 1958, the Post-Secondary Technical School (abbreviated: VTŠ) which subsequently merged into FSB was established and technological laboratories started to emerge in 1961. In 1963 the postgraduate teaching (3rd level of teaching at that time) started. The new building at the current location of the Faculty (South Building of the Faculty) started to be built, in which the teaching activities started in the academic year 1966/67.

The Faculty is accredited to carry out full-time and part-time programmes in Mechanical Engineering and Naval Architecture as well as Aeronautical Studies. The provision includes undergraduate and graduate studies which are offered on a 3+2 basis. In addition to the undergraduate and graduate studies the Faculty offers doctoral study as well as life-long-learning programmes, all related to Mechanical Engineering and Naval Architecture.

The lack of funds from the state budget has been a significant problem in operation for some time now; therefore the Faculty has to make considerable efforts to find sources of financing through cooperation with industry and finding partners for participation in international projects. There is also a problem in the educational structure of the non-teaching staff: the requirements for highly educated staff are rising, whereas the regulations do not enable an adequate filling up of vacancies with more qualified persons.

The governing body of the Faculty is the Faculty Council whose members are mainly the professors, plus a representative of the associate professors and students, who make up 15% of the membership. The Faculty is headed by a Dean who is supported by three vice- deans, with specific responsibilities and administrative staff. The Management Board, chaired by the Dean oversees the work of the Faculty.

The mission of the Faculty is to achieve and permanently maintain excellence in scientific, teaching and professional activities, aimed primarily at using comparative advantages. The Faculty is accomplishing its mission by educating experts through undergraduate, graduate, postgraduate doctoral and specialist studies, as well as through summer schools and lifelong learning programmes in the field of Mechanical Engineering, Naval Architecture and Aeronautical Engineering. In the field of Mechanical Engineering, the Faculty offers a whole range of specializations such as: Production Engineering, Process and Power Engineering, Materials, Mechatronics and Robotics, and similar; at some universities abroad, these are being run as separate courses.

The work of the Expert Panel

For its work the panel drew upon the self-evaluation report prepared by the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb. They carried out a site visit to the Faculty on 23rd and 24th April. During the visit they saw the premises and physical resources and held meetings with the following groups:

- Faculty Management Board
- The Self-Evaluation Group and the QA Committee
- Heads of Departments
- Teaching Staff
- Teaching Assistants
- Students
- The Vice-Dean for Curriculum and Student Affairs, Heads of Study Programmes (undergraduate, graduate and postgraduate)
- The Vice-Dean for International Affairs and the Vice-Dean for Science and leaders of research projects

They also examined the facilities of the Faculty and the classrooms and visited a few classes, in which they held a brief question and answer session with the students.

DETAILED ANALYSIS BASED ON STANDARDS AND CRITERIA FOR RE-ACCREDITATION

1. Institutional management and quality assurance

1.1. The institution has clearly identified its mission as higher education, professional and scientific research organisation in Mechanical Engineering and Naval Architecture. There is strong evidence that the institution has conducted systematic strategic planning of engaging its stakeholders in defining its vision, goals and strategy in line with its mission, but stronger involvement of all key stakeholders and industries as well as international collaborations will improve. **It is therefore recommended that the institution seeks greater involvement of all key stakeholders and that this involvement is better formalised.**

1.2. Currently the institution has relevant legal documents that formally set out its organisational structure. However, external constraints bound the possibility of better organizational structure and academic parity. This kind of organizational structure lacks clarity and is not likely to provide the most efficient basis for operation. **It is therefore recommended that the institution revises its organization in the scope of a clearer strategy which also needs to improve.**

1.3. The panel finds the Faculty to be willing to become a research-led institution but finds no evidence and strategy to achieve such a level. **It is recommended that the institution actively contributes further resources to improving and promoting more scientific research and international collaborations, and particularly more involvement in European research activities. Staff development through further training and international exchange should also be a part of the institution's strategy to become a research-led Faculty.**

1.4. The study programmes offered by the institution are aligned with its mission of providing higher and professional education related to Mechanical Engineering and Naval Architecture.

1.5. The institution has implemented formal mechanism for monitoring and improvement of the quality of its teaching. A good feedback system has been established.

1.6. The institution has implemented systems of quality assurance and continuous quality improvement for its education programmes, although in relation to its research activities such systems are less well developed and there is limited formalised control. Stakeholder involvement is generally limited. **It is recommended to strengthen the systems for quality assurance and continuous quality improvement for research outputs and formalise and strengthen the involvement of stakeholders in all such systems. The Faculty needs more input than the baseline to achieve a higher research standard.**

1.7. The institution has implemented formal mechanisms for monitoring and improvement of the quality of its teaching, although the feedback from monitoring is not fully provided to the students or faculty members. In addition to this, inputs and comments of alumni have not been formalized and implemented as a part of the quality mechanism**. It is recommended to establish a formal system of regular feedback in the frame of quality monitoring, especially from the alumni.**

1.8. The panel finds some evidence of numerous research outputs of high quality at the Faculty. There is evidence that the Faculty is actively involved in many high quality research projects. However, if the Faculty aims to become an internationally recognised research-driven institution, better policies of improving research quality need to be developed in a much wider range. **An institutional level of recognition and supporting system needs to be implemented.** The panel finds no strong evidence.

1.9. The institution has established formal rules and ordinances for the highest level of ethical conduct. However, it is still at the early stage. The panel has found no evidence of putting these into operation.

1.10. The comment under 1.9. also applies here.

2. Study programmes

2.1. Enrolment quotas should be arranged on the university level, and **the Faculty should be involved in changing policy and raising the motivation of students.**

2.2. The enrolment quotas are in line with the institutional resources for quality teaching and analysis of the pass rate.

2.3. Student learning outcomes at the level of a study programme are set by the teachers, but not included in the programme documents. **It is recommended that the institution ensures that the learning outcomes are included in the programme documents. The institution needs to indicate more clearly the levels of outcomes expected for the students.**

2.4. The teaching programmes are developed in the institution. The quality review and assessment of these programmes have been an internal activity. There are no signs of external inputs on monitoring, recommending changes to and quality controlling these programmes. **It is recommended that the institution reviews its programmes and ensures that all units of learning are appropriately assessed. A cross-checking system with fellow universities in the country or international institutions as well as reviewing by national or international experts in the field is recommended.**

2.5. Appropriate arrangements are in place to calculate the allocation of ECTS credits so that they reflect the workload of the students.

2.6. The content and quality of each study programme conforms to internationally recognised standards in a way that the qualifications can be internationally recognised. **It is recommended that study programmes' and teaching quality are monitored at the national and international level.**

2.7. A range of different teaching methods have been used and learning materials are available online. The approach to e-learning is well supported by a well-developed platform although **the approach to e-learning needs further development.**

2.8. The resources for learning are generally good and provide appropriate support for student learning. There is a well-developed platform to support information for students in connection with their learning, progress and achievements.

2.9. Students have some opportunities to experience practical applications on campus and with industries. However, the number of internships available is relatively limited. **It is recommended that the institution develops and expands its links with domestic and international industries to provide better opportunities for student practice.**

2.10. The institution has defined formal processes for the proposal, approval and implementation of new study programmes and has appropriate arrangements in place for the development, innovation and improvements of programmes. There is some stakeholder involvement in these processes but it is relatively limited and not formalised. **It is recommended to strengthen stakeholder involvement in programme approval and development. The Faculty could consider establishing an advisory committee consisting of international academics, industrial experts and other stakeholders to advise on the curriculum of the programmes.**

3. Students

3.1. The information packages available to prospective students contain clear information regarding the level of the programmes, qualifications and academic titles as well as possibilities for further education and employment. Application for enrolment is made via the Croatian Agency for Science and Higher Education who publishes the Faculty's programmes and a call for enrolment is made in the press and on the Faculty web pages. The Faculty web pages and printed material provide information about the programmes, modules, courses of study and academic titles. The Faculty participates in an annual recruitment fair organised by the University of Zagreb.

3.2. Based on the State Matura, the admissions criteria and procedures are publicly stated and consistently applied.

3.3. Given that acceptance is based on the State Matura there is no need for additional criteria to determine acceptance.

3.4. The institution supports the students very well in a number of ways in their extra-curricular activities, including sport, cultural and other activities.

3.5. The institution offers counselling and mentorship to students, including a personal tutor system, but this is not fully recognised by students. **It is recommended that the institution gives more attention to explaining to the students the support system and encouraging them to use it to their advantage.**

3.6. The institution cares for and raises the level of the student standard.

3.7. The institution supports the work of the Student Council.

3.8. The institution publishes its methods and procedures for student assessment and uses various and appropriate methods for student monitoring. The students understand the

assessment arrangements. There is appropriate feedback to the teachers and the students have a right to appeal.

3.9. Although the institution collects information about employment of graduates from its connections with professional associations and surveys, the amount of information that the institution has about the employability of its graduates is relatively limited. Its contacts with the alumni are also relatively limited. **It is recommended that the institution strengthens its statistical information relating to employment and extends its contact with the alumni.**

3.10. **It is recommended that institution establishes an alumni database.**

3.11. With student membership of the deliberative committees of the institution, appropriate opportunities are provided for the students to participate in decision making processes and the resolution of matters affecting their experience.

3.12. Except for information aimed at prospective students, information provided by the institution to the public about its study programmes, learning outcomes, qualifications and employment opportunities is relatively limited. **It is recommended that the institution to develop a communication plan to improve the publicity of its activities and achievements.**

3.13. Opportunities are provided for the students to express their views and suggest areas for improvement, through the student membership at deliberative committees etc. Their views are also sought through the completion of teaching evaluation forms. However, students are not always well informed about the results of their comments or provided with feedback. **It is recommended that the institution gives more attention to ensure that feedbacks are made to the students so that they can understand the response to their comments.**

4. Teachers

4.1. The qualifications of the teachers are adequate.

4.2. The institution only partly carries out a policy for the growth and development of human resources. **Further activities are needed to maintain the high level of the institution in the future.**

4.3. The institution demonstrates the employment of sufficient number of full-time teachers for study programmes to ensure the quality and continuity of teaching and learning.

4.4. The institution takes into account the number of full-time teachers, maintaining the optimal ratio between students and full-time teachers.

4.5. The institutional policies for its teaching staff are in the early stage of implementation. Pedagogical training is currently limited although there are plans to develop it.

4.6. The institution's procedures for promotion and other forms of teachers' advancement are appropriately developed, understood and accepted. These have been implemented in a fair and a consistent manner. Appealing mechanism exists.

4.7. The policies governing the assignment of teachers' workloads are generally fair between teachers. However, no adequate attention to the balance in the teachers' workload between teaching and research has been paid. This creates particular pressure on teachers who are active in maintaining and developing their research outputs. **It is recommended that the institution carefully monitors the workload for teaching and research of its academic staff members, and develops a mechanism to balance the time allocation between the two to ensure more research activities.**

4.8. The institution is aware of the needs of teachers to devote time to their teaching duties and that they are not compromised by commitments external to the institution.

5. Scientific and professional activity

5.1. The institution has policies in place for existing and planned research activities. It is clearly important for the institution's strategic plan to be in line with that of the University*. **The research strategy should be formalized at the institutional level.**

5.2. Mechanisms to ensure an efficient operation of research activities are not well developed. For example, the workload between research and other academic activities of teachers needs to be balanced to allocate sufficient time for research activities. The monitoring of researcher performance is also not well developed. The research outputs have not reached the levels expected for a leading institution in the country. **It is recommended that the institution strengthens and develops the mechanisms to ensure further improvements in its research activities.**

5.3. In planning and implementing its research agenda the institution is developing good links both in Croatia and abroad and both with individual institutions and with groupings. Opportunities are taken to use international links to contribute to the development of research by, for example, encouraging key note speakers to conferences. **The institution is recommended to continue its efforts to further materialise its plans for national and international cooperation.**

5.4. While the importance of research is clearly in evidence in the institution's mission and there is a broad awareness among the academic staff of the importance of research, this is not clearly translated into an apparent awareness of the importance of achieving the highest quality outputs. As a result the research efforts did not fully make an intellectual contribution to the institution's reputation. **It is recommended that the institution makes efforts to increase the outputs in top quality international academic journals.**

5.5. The institution's arrangements for supporting its young researchers are in the early stage of implementation. **It is recommended to develop an appropriate mechanism of staff training and development mechanism. International mobility should be considered and encouraged.**

5.6. The institution has partly implemented a policy of promoting research excellence.

5.7. The institution uses evidence of productivity of its research activities, including publications and presentations at conferences, but the scientific research of the Faculty is not at present systematically monitored. Also, there is little evidence that information is being used in a strategic way to enhance the quality of research by, for example, distinguishing clearly between types of outputs. **The institution is recommended to take a more strategic approach of identifying high level research activity to support the improvements in research quality.**

5.8. The institution keeps track of multiple evidences of scientific productivity, such as Croatian and international publications, citations, patents, and other.

5.9. The expert panel finds lack of keeping track and monitoring technology transfers aimed at strengthening industrial cooperation.

6. *International cooperation and mobility*

6.1. The institution has arrangements for acknowledging ECTS credits gained by incoming students but actually the inward mobility of students from other Croatian higher education institutions is very limited. Most Ph.D. students also completed their studies within the Faculty. This relatively low level of inward mobility partly reflects the fact that the mobility is not highly promoted. **The institution is recommended to encourage and facilitate inward mobility including offering more provision in English language and attracting more regular foreign guest lecturers.**

6.2. Students have opportunities to take some proportion of their studies abroad. Notwithstanding this success in the context of the whole University, given the total numbers of students, the level of mobility is relatively low. **It is recommended that the institution continues to develop the opportunities for more students to benefit from international experience.**

6.3. The extent of international cooperation and mobility of teachers is satisfactory. The institution provides support and encouragement for this although opportunities for extended periods abroad are limited. Teachers from the institution have attended other universities as guest lecturers. The institution has been involved in a number of cooperative activities with other universities which have led to scholarships and exchanges.

6.4. The institution is involved as a member of a range of international organisations associated with its areas of study.

6.5. The opportunities for attracting students from abroad at present are fairly limited because only very limited parts of the programmes, confined to electives, are delivered in English or in a language other than Croatian. The development of ECTS credits for all programmes will support future developments in attracting foreign students but until programmes are made readily available in English or other languages this will remain very limited. **It is recommended that the institution moves towards offering a greater proportion of its programmes in English and takes steps to improve the resources offered to international students.**

6.6. The institutional involvement in the EU Life Long Learning (LLL) Programme is not yet developed. **It is recommended that the institution explores opportunities for cooperation in the EU LLL programme.**

6.7. The institution has developed other forms of international cooperation by, for example, welcoming guest foreign lecturers, visits by foreign student groups, arranging international conferences. **The institution is recommended to continue to develop and extend its international links.**

6. Resources: administration, space, equipment and finances

7.1. Many of the resources for enrolled students are good. These include IT resources and the virtual learning environment which provides access to course information as well as electronic journals. Classroom and practical work rooms have appropriate equipment. The institution also provides group and individual study spaces, library resources and appropriate equipment. Some of the spaces, including the library, are limited in size for the number of students.

7.2. The institution has developed rules which regulate the development of non-teaching staff and provide training opportunities in line with the mission of the institution.

7.3. In keeping with its research agenda, the institution ensures that laboratory equipment and usage protocols comply with recognized international standards.

7.4. The institution provides appropriate equipment and technical support but **it should establish some of laboratories accessible via Internet.**

7.5. The institution collects, analyses and uses information about its activities although this could be available and used in a more systematic way to support programmes of improvement. Notably the system for feedback of information to students from the student satisfaction surveys is developed up to a point, but it is not well developed at the staff level. **It is recommended that information is obtained and used more systematically.**

7.6. The library is generally well equipped with up-to-date material and it houses the main relevant journals, mostly online. There is an active purchasing programme for the library resources but the access to electronic resources is still limited.

7.7. Financial stability of the institution is harmonised with its mission and enables all students to graduate from their programmes. Sources of finance and all conditions related to financing are transparent and do not limit institutional autonomy when making decisions about teaching and research.

FINAL REPORT AND RECOMMENDATIONS BY THE EXPERT PANEL

In general the situation at the Faculty is very good, although some critical remarks must also be made.

ADVANTAGES (STRONG POINTS)

Some globally recognized researchers

Some professors and researchers have established good international contacts, in Europe in particular. Some international symposiums organized at the Faculty are at high levels.

Labs that support research

The expert panel visited some high standard well equipped laboratories which include calibration, material science, welding, and automation and robotics.

Amount of research

The expert panel noticed that both staff members and students the panel has met are proud of their research activities. All laboratories visited have active research activities.

Faculty management

The panel had the impression, that the University of Zagreb Faculty of Mechanical Engineering has a good management system. The welfare of both academic staff members and students is good. Internal conferences were organised to improve the teaching and research of the Faculty.

DISADVANTAGES (WEAK POINTS)

Monitoring system for staff

The institution lacks a sufficient periodic checking system of monitoring research activities to ensure high level research outputs.

Lack of research workload

The balance of workload between research and teaching of all academic staff members of the institution needs to be improved to allow more time for high level research activities.

Alumni network

Alumni network is important and needs to be further developed. Many alumni of the Faculty work abroad or hold important positions in industry. The institution needs to develop these rich resources to benefit and expand its research activities.

Staff development

The staff development is critical to the further development of the institution. It is necessary that the research staff has the opportunity to visit leading industries and participate at international symposiums and conferences.

Outcomes of research and study programmes

The outcomes of research are not clearly stated.

Assistants

The panel noticed that the cohort of assistants lacks enthusiasm in commenting on their job and further development. They are the future of the institution and need to be motivated through training, staff development, and knowledge exchange both nationally and internationally.

Students

The panel found that all students interviewed are satisfied with the Faculty, but commented on too much theory, insufficient practical knowledge, and poor information and support from the institution in future career.

RECOMMENDATIONS FOR IMPROVEMENT OF QUALITY

1. **Management of the Higher Education Institution and Quality Assurance**

   It is recommended that:

   - The institution seeks greater involvement of all key stakeholders and that this involvement is better formalised.
   - The Institution revises its organization in scope of a clearer strategy which also needs to improve.
   - Systems for quality assurance and continuous quality improvement for research outputs be strengthened and that the involvement of stakeholders in all such systems be formalised and strengthened. The Faculty should input more than baseline to achieve higher research level.
   - Formal system of regular feedback of quality monitoring is established, especially from the alumni.
   - If this Faculty wants to become research driven institution they should develop better policies for improvement of research quality as panel does not find exact evidence of it.

2. **Study Programmes**

   - Enrolment quotas should be arranged on the university level, and the Faculty should be involved in changing policy, raising the motivation of students.
   - It is recommended that the institution ensures that the learning outcomes included in the programme documents focus on the outcomes expected for the students and that they indicate more clearly the outcome levels.
   - It is recommended that the institution reviews its approach to assessment to ensure that the assessment for all units of learning most appropriately assesses the learning for each unit by implementing a cross-checking system.
   - It is recommended that study programmes and teaching quality should be monitored at the national and international level.
   - It is recommended that the institution develops and expands its links with domestic and international industry to provide better opportunities for student practice.
   - It is recommended that stakeholder involvement in programme approval and development is strengthened.

3. **Students**
   - It is recommended that the institution gives more attention to explaining to the students the support system and encouraging them to use it to their advantage.
   - It is recommended that the institution strengthens its statistical information relating to employment and that it extends its contact with alumni.
   - It is recommended that the institution should establish an alumni database.
   - It is recommended that the institution develops a communication plan to ensure that the public more generally knows about its activities and achievements.
   - It is recommended that the institution gives more attention to ensuring that reports are made to the students so that they can understand the response to their comments.

4. **Teachers**
   - It is recommended that the institution carefully monitors the balance between time for teaching and research.

5. **Scientific and Professional Activity**
   - The strategic side of research should be formalized on the institutional level.
   - It is recommended that the institution strengthens and develops the mechanisms to ensure that research activities are improved.
   - The institution is recommended to continue in its efforts to realise its plans for national and international cooperation.
   - It is recommended that the institution makes efforts to increase the outputs in top quality international academic journals.
   - The institution is recommended to take a more strategic approach to indicators of research activity so that they will support the improvements in research quality.

6. **International Cooperation and Mobility**
   - The institution is recommended to encourage and facilitate inward mobility including offering more provision in English language and attracting more regular foreign guest lecturers.
   - It is recommended that the institution continues to develop the opportunities for more students to benefit from international experience.

- It is recommended that the institution moves towards offering a greater proportion of its programmes in English and takes steps to improve the resources offered to international students.
- It is recommended that the institution explores opportunities for cooperation in the EU LLL programme.
- The institution is recommended to continue to develop and extend its international links.

7. Resources, Administration, Space, Equipment and Finance

- It is recommended that information is obtained and used more systematically.