



**RE-ACCREDITATION OF THE FACULTY OF MECHANICAL
ENGINEERING IN SLAVONSKI BROD
JOSIP JURAJ STROSSMAYER UNIVERSITY OF OSIJEK**

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**COMPOSITION OF THE EXPERT PANEL FOR RE-ACCREDITATION OF THE
FACULTY OF MECHANICAL ENGINEERING IN SLAVONSKI BROD, JOSIP JURAJ
STROSSMAYER UNIVERSITY OF OSIJEK**

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INTRODUCTION

Short description of the evaluated institution

The year 1962 saw the beginning of higher education in the field of technical sciences in Eastern Croatia with the establishment of the Centre of Part-Time Studies in Engineering in Slavonski Brod, set up by the Technical College from Zagreb. Slavonski Brod is a town well-known for its factory “Đuro Đaković”, established as early as 1921. In the first seventeen years of work, the Centre was supported by the institution known today as the Faculty of Mechanical Engineering and Naval Architecture in Zagreb. The Centre was one of the founders of the University in Osijek in 1975. In the year 1979, Đuro Đaković Institute of Mechanical Engineering joined the University of Osijek. After the reorganisation of Đuro Đaković Institute of Mechanical Engineering in 1983 into the Institute of Mechanical Engineering – Mechanical Engineering Faculty, the institution assumed a pioneering role in the development of research and teaching at the former VI/I level (professional studies). University study programmes have been carried out since 1985. In 1991, the Institute of Mechanical Engineering – Mechanical Engineering Faculty started to operate as an independent entity within the Josip Juraj Strossmayer University of Osijek, under the name the Faculty of Mechanical Engineering in Slavonski Brod. During the war years teaching was conducted in Pleternica and Požega. Since the year 1995, the Faculty has been carrying out programmes for employees of the Croatian Ministry of Defence (total of 8 generations have been enrolled).

In 1998, the Faculty was issued a licence to carry out the postgraduate university study programme within the technical sciences area, scientific field Mechanical Engineering, specialisations Production Systems and Production Procedures. In year 2000 the first Master of Technical Sciences was promoted, and in 2002 four doctoral dissertations, mentored by the teachers from the Faculty of Mechanical Engineering in Slavonski Brod, were defended.

Since 2005, university undergraduate and graduate study programmes Production Engineering, lasting 3,5 + 1,5 academic years and consisting of four modules, have been carried out in line with the Bologna process requirements (the 3+2 scheme was introduced in 2010). In 2006, the Faculty was issued a licence from the Ministry of Science, Education and Sports (MSES) for carrying out postgraduate doctoral study programme with three

modules, and a year later, for the postgraduate specialist study programme Development of Products and Technologies, with four modules.

The Faculty researchers are involved in two scientific research programmes and 11 scientific research projects funded by the MSES. Last year, upon the proposal of industrial subjects in Eastern Croatia, the procedure was initiated for obtaining the licence to carry out university graduate study programme Power Plants.

The total number of students is about 760. Most students come from vocational schools. Due to lack of student dormitory facilities, a large number of students who come to study to Slavonski Brod from other places have difficulties in finding accommodation. Extracurricular activities include playing indoor soccer in two indoor soccer teams, and rowing in the Faculty's amateur rowing team. The students are also involved in social, cultural and sports activities of the city.

The Dean, supported by three vice-deans (the Vice-Dean for Education, the Vice-Dean for Science, and the Vice-Dean for Development and Cooperation with Economy) is responsible for the management of the Faculty. The Faculty is organised into 4 departments and 10 chairs, plus one independent chair. The composition of the teaching staff is as follows: 11 full-time professors (two working part-time, and one university vice-rector), 10 associate professors, 2 assistant professors, 4 senior lecturers, 9 assistants, one senior assistant, 10 junior researchers (6 of them holding Ph.D. degrees), and 3 senior administrative assistants. Teaching staff and non-teaching staff ratio is around 2, 5:1.

The Faculty is spread over 4,500 square meters on three different locations. The project documentation has been finished for the creation of the new Centre for Knowledge and Technology Transfer. The Centre will have a 150-seat amphitheatre and provide the teaching for first year students in one shift (currently the teaching is carried out in two shifts).

Faculty employees are members of around 15 national and 8 international scientific and professional associations. International cooperation with numerous faculties is carried out through ERASMUS and CEEPUS programmes .

The mission of the Mechanical Engineering Faculty is reflected in its contribution to sustainable development of society through continuous improvement of knowledge by educating students at all levels, as well as in implementation of scientific and technological research in the field of Mechanical Engineering. Basis for mission achievement the

Faculty finds in the 90-year-long tradition of mechanical engineering in Slavonski Brod, in many years of practices in the transfer of knowledge, skills and experiences of its carefully selected and trained staff to the youth, thereby encouraging their affiliation towards mechanical engineering profession and technology in general, and promoting technical culture in the community.

Description of the methodology

The expert panel based its review on the self-evaluation of the Faculty of Mechanical Engineering in Slavonski Brod, Josip Juraj Strossmayer University of Osijek, as well as on the site visit conducted on the 23rd and 24th March 2012. During the site visit, the expert panel held meetings with:

- Management of the institution
- The group that worked on the self-evaluation, commissioner for quality assurance, and representatives of the Committee for Quality Assurance
- Vice-Dean for Education
- Heads of postgraduate specialist and postgraduate doctoral studies
- Teachers
- Assistants and junior researchers
- Vice-Dean for Science
- Students
- Project leaders

The panel also visited the Faculty facilities (laboratories, library, offices for administrative staff), and classrooms, with members of the panel having short discussions with attending students.

DETAILED ANALYSIS BASED ON STANDARDS AND CRITERIA FOR RE-ACCREDITATION

1. Institutional management and quality assurance

1.1 The mission of the Mechanical Engineering Faculty is reflected in its contribution to sustainable development of society through continuous improvement of knowledge by educating students at all levels, as well as in the implementation of scientific and technological research in the field of Mechanical Engineering. Being aware of the fact that any well-functioning state bases its progress on developing its own industry, the Faculty promotes the need for preservation and modernisation of production resources, within which the training of students and staff on the principles of competitiveness, ethics and creativity is defined as the primary strategic importance. Setting its own example through persistent work on improvement of provided services along with the implemented quality assurance system, the Faculty aims to be recognised as a centre of excellence in education, research and mechanical engineering profession, as a desirable place for studying, and a good partner in the business sector. The Faculty created the Development Strategy for the period 2009 – 2014 and produced annual reports for years 2010 and 2011. However, the Faculty does not engage its stakeholders in systematic strategic planning processes. **Recommendation: The Faculty management should introduce measures to encourage researchers to apply for EU projects (especially FP7) and technological projects of the Croatian Institute for Technology in cooperation with the industry. This would result in securing project funding for the realisation of the Faculty's strategic goal to become a centre of excellence in education, research and professional activities in the field of mechanical engineering.**

1.2 The institution has developed all relevant legal documents that define its organisational structure. Thus the processes within the organisational structure of four departments and 11 chairs are fully legally formalised.

1.3 The institution within a university actively contributes to achieving university goals and has aligned its strategy with the university. The Faculty has a clear vision of its future activities: to profile itself as a leading centre of higher education in the construction of

new machinery, development of modern structural solutions, application of new technologies, and energy and environmentally sustainable development in Eastern Croatia. **Recommendation: In line with its mission, the Faculty should implement a vision which will ensure progress in all areas of its activities.**

1.4 Study programmes offered by the institution are aligned with its mission. However, the dislocation of the Faculty and the lack of adequate space, as well as work overload of teachers might pose obstacles to harmonious programme implementation. Furthermore, the Faculty has not yet developed lifelong learning programmes, due to the current situation in the country. **Recommendation: The Faculty should consider reducing the teaching overload as soon as possible in order to give the teachers more time to focus on their research. It should also develop lifelong learning programmes.**

1.5 Study programmes are aligned with the Baseline of the Croatian Qualifications Framework. After the initial 3.5 + 1.5 model, the Faculty opted for 3 + 2 standard Bologna model. After completing the undergraduate study programme in Mechanical Engineering, graduates can either enter the labour market or continue their studies in one of the four graduate programmes: Product Design and Development, Production Logistics, Materials Engineering, and Mechanical Engineering Technologies. Graduate study programmes can be enrolled by students who completed university undergraduate or professional undergraduate programmes at other national or international higher education institutions. Transfer of these students is possible under the condition that they take additional courses for the duration of one additional semester or one academic year. Students who complete graduate study programmes can enrol in one of postgraduate programmes offered by the Faculty or other national and international higher education institutions. This organisation enables vertical mobility of students, with possibilities of choosing different specialization, as well as outgoing and incoming mobility through different exchange and mobility programmes. ali isto tako i da dođu studenti s drugih srodnih fakulteta.

1.6 The institution has established the effective system of quality assurance and improvement. However, the panel found that the effectiveness of the system and continuous quality improvement with the goal that a culture of excellence will pervade

all aspects of its internal operations and shape its standing with external stakeholders has only partly been implemented. **Recommendation: To improve excellence in scientific research by attracting national and EU research funds.**

1.7 Although the institution has developed formal mechanisms for monitoring and improvement of the teaching quality, there are still no sanctions for teachers with poor student questionnaire results. **Recommendation: Teachers with poor questionnaire results should consider discussing the results with their students in order to find the reasons for the bad grades. If it proves that the low grades are justified, certain measures should be undertaken.**

1.8 The institution has developed formal mechanisms for monitoring of the research quality. Therefore, the Faculty should insist on teachers publishing in highly ranked scientific journals. **Recommendation: The Faculty should develop measures to encourage mobility of teachers and junior researchers and publishing in international journals with high impact factors (and not limit itself to publications in national journals and conferences). Teacher work overload should be reduced so that enough time is left for research. The Faculty should ensure that young researchers spend part of their careers at international institutions.**

1.9 The institution has established rules for ethical behaviour in its teaching and research activity. The Code of Ethics and the Regulations on the Disciplinary Responsibility of Teachers and Assistants of the Josip Juraj Strossmayer University of Osijek are published on the Faculty web site. Postgraduate students learn ethics in the Basics of Scientific Research course. Ethical behaviour is also ensured by reviewing doctoral thesis applications, and by presenting doctoral thesis in a public seminar before defending it to a doctoral committee. The Ethics Committee is responsible for the implementation of the University Code of Ethics and the implementation of procedures where a breach of the Code is suspected.

2. Study programmes

2.1 Each study programme is defined in line with clearly stated student learning outcomes and the institution has established mechanisms for approving, monitoring and improving its programmes and qualifications. The Faculty has applied for a licence to carry out new university graduate study in Power Engineering, according to the needs of the national industry.

2.2 As a result of the growing interest in mechanical engineering, the number of full-time students enrolled in undergraduate studies has increased by 15% when compared to previous years. However, the Faculty's limited capacities and the number of unemployed graduates are the main obstacles to significantly increasing students' enrolment. Such an increase would also burden the already overloaded teachers. **Recommendation: To distribute workload evenly between the teachers because at the moment it is obviously not balanced well. Additionally, many teachers work at the University of Applied Sciences in Slavonski Brod, which also increases their workload. The panel did not get information on the average teacher workload at the University of Applied Sciences in Slavonski Brod, and it remains unclear what the average teacher workload is.**

2.3 Student learning outcomes, set by the teacher and stated at the level of a study programme and its courses, clearly describe knowledge and skills of the graduates. To improve monitoring of outcomes defined in developing study programmes and the quality of studying, the Faculty applied for project under the IPA IV Programme „Further Development of the Croatian Qualifications Framework“, titled „ME4CatalOGUE (Mechanical Engineering for Catalogue) – Croatian Catalogue of knowledge, skills and competences for Mechanical Engineering studies (Bachelor, Master and Doctoral study programmes) based on learning outcomes“. All learning outcomes are published at the Faculty web site.

2.4 Teachers at a study programme assure that the assessment of student learning, regardless of its modality, is aligned with stated learning outcomes, that it represents the full range of learning being assessed, and assesses learning at the level of rigour

appropriate to the qualification level. For the majority of courses, continuous assessment of learning is carried out. Monitoring models are developed for undergraduate study programme in Mechanical Engineering, and graduate study programmes Production Engineering and Mechanical Engineering. Cumulative assessment methods are used to assess various student activities (e. g. preliminary exams, seminar papers, other forms of assessment) in most courses. In addition to written exams, there are also oral examinations carried out for majority of courses. Students claimed that there were no surprises regarding exams and that the teachers provide them with the lists of materials for seminars and exams on time. In addition, the teachers also publish numerous textbooks which also help students considerably in preparing for exams.

2.5 Allocation of ECTS credits reflects the realistic estimate of student workload. In order to adjust the number of allocated ECTS credits with the realistic estimate of student workload, a questionnaire for assessing the actual student workload for each course will be carried out among students. Based on questionnaire results, the Faculty will adjust the number of ECTS credits and make possible changes in programmes within the 20% limit

2.6 The content and quality of each study programme conform to internationally recognized standards, ensuring the international recognition of its qualification. However, the panel found that this criterion is formally developed but only partly implemented. **Recommendation: 1. To encourage actively the mobility of both teachers and students in order to improve the existing system and develop critical thinking regarding conformity of programmes to international standards. 2. The Faculty should create a special working group which will critically review all the study programs and compare them with the leading European and world technical universities.**

2.7. Although the students expressed their satisfaction with the application of classical methods in teaching, the teachers select different strategies in their teaching, ranging from the classical to modern ones. The panel believes that all types of new technology should be used in teaching. The teachers should also encourage their students to use

different learning resources and to develop critical attitude and creativity in the course of their studies. **Recommendation: Students should be constantly reminded that studying is not just about passing exams, but also about developing creative thinking skills. The Faculty should provide separate room for learning where students would have better conditions for work, either on their own, or in groups. Two places in the library are far from adequate.**

2.8 Although some courses provide online teaching materials, most of them do not offer this possibility to students. Due to the limited number of computers and the lack of space in the library, students do not have full access to electronic databases. **Recommendations: Teachers are recommended to improve teaching materials for their courses at the Faculty web site. The Faculty library should provide access to additional resources for students when preparing for examinations, seminar papers and graduate theses.**

2.9 Although students have opportunities to reinforce and apply their learning in the context of practical applications, as appropriate to learning outcomes, the panel was under the impression that internships were not planned systematically. Field work (within the course Industrial Practice) takes place in nearby companies and power plants with the available equipment. The main problem is the limited number of companies that have an interest or conditions to offer student internships. The Faculty has plans to formalise international student internships in the future. **Recommendation: Regarding the current economic situation in the region, additional efforts should be made to improve the cooperation with the industry (through joint projects and by ensuring that students apply previously acquired knowledge during internships). Students should also be involved in future projects with the industry.**

2.10 The institution has defined and adopted formal processes by which new study programmes are proposed, approved, and implemented. The procedure for obtaining a licence for a new module at graduate study programme has been initiated (see criteria 2.1). These procedures also monitor development, innovation and improvement of the existing programmes and also include stakeholders from the industry.

3. Students

3.1 Faculty does not provide information packages that inform potential students about the level of study programmes, qualifications, academic titles awarded to graduates, and possibilities for further education. The Faculty web site offers only scarce information. Virtual Faculty tour has been recently introduced. Visits to high schools in order to attract prospective students are regularly organised. Each year, "Mechanical Challenge", an event designed for high school pupils, mechanical engineering students, and local business entities is organised. During this event, high school pupils have opportunity to attend lectures and visit Faculty laboratories. **Recommendation: Since the Faculty attracts students from five different counties, it is difficult to provide information to all. Thus, the panel recommends that it provides information packages for potential students on its web site, with the information about the level of study programmes, qualifications, academic titles and possibilities for further education and employment.**

3.2 Admission criteria and procedures are publicly stated and consistently applied. Since students of previous generations had different levels of prior learning, admission procedures have been somehow simplified with the introduction of the State Matura Exam. The Faculty analyses the reasons for student drop out, e.g. the lack of motivation, difficulties in carrying out their duties, and failure at seminars and exams. The Vice-Dean for Education explained that some students also drop out because of financial reasons.

3.3 Since the institution has established that the competencies of applicants evaluated upon admission are not aligned with the demands and expectations in the future career of graduates, a preparatory seminar for the first year undergraduate students has been introduced in order to minimize the differences in prior learning between students, and prepare them for lectures. During the preparatory seminar, students revise mathematics and physics done at secondary school and learn about the basic mechanical engineering terminology.

- 3.4 The institution supports students in their extracurricular activities. The Faculty also financially supports its amateur rowing team, and two indoor soccer teams. The panel found students to be very satisfied with the level of support and engagement of teachers in their extra-curricular activities.
- 3.5 The institution offers counselling, mentorship and professional orientation to ensure personal and professional development of the students. Teachers organise individual consultations for students and are at their disposal for all questions and dilemmas regarding their studies.
- 3.6 Low student standard can be explained by the large number of incoming students and few places in the dormitory. Many students are renting private accommodation. Since the Faculty does not have its own dormitory or subsidised student canteen, it does not have direct influence on the level of the student standard.
- 3.7 The Faculty supports the work of the Student Council. One member of the Student Council is also a member of the Committee for Quality Assurance. During interviews with students, the expert panel was informed that their opinions were highly regarded by the Faculty management. Students also emphasised that they were directly involved in decision making processes and even stopped implementation of some Faculty decisions.
- 3.8 The institution uses and publishes various methods and procedures for student assessment and uses various methods for student monitoring. Students are aware of the assessment procedures (written and/oral exams) in advance. Examination results are available to students within a week. Teachers give feedback to students in order to improve their knowledge. Students have the right to appeal formally about grades. The panel interviews with students indicated their satisfaction with these measures.
- 3.9 The Faculty systematically collects data on the employability of its graduates from the five regional offices of the Croatian Employment Service. During the site visit, the Faculty Secretary provided detailed information on the number of unemployed mechanical engineering bachelors and masters, which proved to be quite low, to the

expert panel. Most of the unemployed professionals already had jobs in the past but lost them when their companies became insolvent.

3.10 Until recently, the institution had contacts with the alumni mainly through cooperation with the industry in joint projects, organising student internships, and visits to the companies. The Faculty Alumni Club was established in 2011 and the Faculty expects to intensify the existing cooperation with the industry in the future. **Recommendation: To intensify efforts to increase alumni participation in the Faculty Alumni Club as a basis for stronger collaboration with the industry not only in Slavonski Brod but also in other parts of the country.**

3.11 The institution ensures that students have appropriate opportunities to participate in its decision-making processes and the resolution of matters affecting their experience (see criteria 3.7.).

3.12 The institution regularly informs the public about its study programmes, learning outcomes, qualifications and employment possibilities, as well as other activities in its annual reports.

3.13 The students can express their opinions and proposals for improvement (see criteria 3.7.).

3.14 The students are informed about the measures implemented on the basis of their suggestions and opinions (see criteria 3.7.).

4. Teachers

4.1 Number and qualifications of the teachers are not fully in line with the Faculty strategic goals. The Faculty does not have sufficient number of assistants. Although the average teacher-to-students ratio is favourable, it is much higher in the first year of studies.

Recommendation: Although the panel realises that the Faculty does not have direct influence on this criteria, its suggestion to the Faculty would be to undertake all possible measures to reduce the work load of overloaded teachers and to ensure that teachers have enough time for their research. One of the recommended measures in order to decrease teaching load of teachers, the Faculty should hire external associates from the industry to hold exercises or/and utilize graduate students as tutors for undergraduates courses.

4.2 The institution has not developed the policy of growth and development of human resources, especially taking into account potential retirements and sustainability of the study programmes and scientific activity. The state law regulating retirement of teachers aged over 65 is currently under public discussion and it is very difficult to make any long term plans. **Recommendation: In order to avoid huge imbalance in the workload of young scientists, the Faculty should make additional effort to create conditions for their fast track advancement. Simulation should be done to show what would happen if all teachers above 60 were to retire (in which case regular implementation of study programmes could become problematic).**

4.3. Based on the analysis of teachers' workload, the panel concluded that the institution ensures the quality and continuity of teaching and learning. Similar to criteria 4.2., the Faculty does not have direct influence over some issues. **Recommendation: To make every possible effort to reduce teacher workload (including hiring external associates).**

4.4. The institution takes into account and collects statistics on the number of full-time teachers. The ratio between full-time teachers and students has risen from 1:19 in the academic year 2006/2007 to 1:25 in 2010/2011.

- 4.5 The institution has introduced additional training in pedagogy, psychology, didactics and teaching methodology for young assistants as one of the conditions for their election into teaching grades. Policies regarding outgoing teacher mobility are still in the initial phase of development. **Recommendation: Increase the participation in CEEPUS and ERASMUS programmes and other international scholarship schemes for long-term mobility of teachers in order to ensure their professional advancement.**
- 4.6 The institution developed and accepted clear procedures for teachers' advancement. Such procedures are implemented in a fair manner, with the possibility of appealing advancement decision. The procedures are formalised in Faculty's legal acts.
- 4.7 Policies governing the assignment of teachers' workload do not provide for a fair and equitable distribution of effort between teaching, research, mentorship and student consultations. During the site visit, the students expressed their satisfaction regarding availability of the teachers for mentorships and consultations. However, the conclusion was that some teachers with teaching overload do not have enough time to conduct research. **Recommendations: See criteria 4.3**
- 4.8 The institution does everything within its power to ensure that its teachers hold a substantial commitment to their teaching and research responsibilities and that these obligations are not compromised by teachers' commitments external to the institution. **Recommendations: See criteria 4.3.**

5. Scientific and professional activity

5.1 The Faculty has established a strategic programme of scientific research the implementation of which is monitored, evaluated and reviewed via defined success indicators. Organising the event called *Mechanical Challenge* for the last four years is the result of successful professional cooperation of the Faculty with the surrounding companies. Professional activities of the Faculty include cooperation with the industry, organisation of professional conferences, summer schools, seminars, periodic laboratory analyses and providing professional opinion and expertise. Scientific research is performed within 11 scientific research projects and 2 programmes funded by the MSES. The Faculty is also involved in bilateral research projects with Slovenian and Serbian partner institutions, and coordinates four CEEPUS projects. **Recommendation: To increase participation in international projects, both as partners and coordinators, and secure funding for purchasing larger laboratory equipment. Considerable numbers of MSES projects are carried out by small groups of only two or three scientists from the Faculty. The Faculty should organise large research groups with identified priority areas of researches.**

5.2 In planning and implementing its research agenda, the institution clearly envisions and provides cooperation with other scientific organisations and industry within Croatia. However, cooperation with respectable international scientific organisations is lacking. **Recommendation: To create an environment that would foster more possibilities for scientific research cooperation with respectable international research organisations.**

5.3 The Faculty statement expresses that at all levels of the institution research is acknowledged as a contributing component of its overall activity. Priority is given to presenting papers at conferences. The panel concluded from the insufficient number of publications in highly ranked scientific journals that the intellectual contribution of research to the institution is lacking. **Recommendation: The Faculty should develop a mechanism for acknowledging and supporting scientific publication by the research staff in peer-reviewed journals with high impact factors.**

- 5.4 The institution supports its young researchers but does not offer ample opportunities for them to gain research experience at their home institutions or abroad. **Recommendation: Considerable effort should be made to encourage young scientists to establish more contacts with their international colleagues and gain research experience abroad (e.g. during writing doctoral theses or conducting postdoctoral research).**
- 5.5 In its Development Strategy the institution asserts the need for promoting research excellence. After reviewing annual reports for years 2010 and 2011, the panel found that many improvements could be made in this area. **Therefore, the recommendation is the same as in Criteria 5.4.**
- 5.6 The institution has developed a policy of encouraging academic publishing. Together with the Faculty of Electrical Engineering in Osijek and the Faculty of Civil Engineering, and supported by the University of Applied Sciences in Slavonski Brod, the institution publishes scientific-professional journal *Tehnički vjesnik* (A Category). In order to become internationally recognised, the teachers need to publish in highly ranked international scientific journals. The panel considers this policy to be in the early stage of implementation. **Recommendation: To publish papers not only in Croatian journals, but also in highly ranked international journals.**
- 5.7 The institution keeps track of multiple evidences of its scientific productivity. Comparative review of mechanical engineering projects in the Croatian Scientific Bibliography (CROSBI) indicates that three out of the top ten projects funded by the MSES and ranked by the number of published CC papers, are coordinated by three teachers from the Faculty of Mechanical Engineering in Slavonski Brod.
- 5.8. In line with its mission, the institution supports professional activities and services, ensures conditions for knowledge and technology transfer through the following activities: joint projects with the industry, organisation of professional conferences, summer schools, seminars, periodic laboratory analyses, and providing expert opinions and expertise.

6. Mobility and international cooperation

6.1 Lack of internal mobility of students at undergraduate and graduate university studies can be explained by the Faculty's physical remoteness from other university constituents. Some of the students, who finished related university study programmes at other higher education institutions, such as one candidate with the bachelor's degree in mathematics and informatics, and one medical doctor, are enrolled in the Faculty's postgraduate studies. Transfers from other higher education institutions assure a multidisciplinary approach to solving research problems. In order to encourage internal mobility of students, the Faculty created two new elective courses in the academic year 2010/2011, *Tribology* and *Numerical Modelling and Simulation*. However, the panel found that the internal mobility process has been partly implemented. **Recommendation: To make additional effort to increase internal mobility of students.**

6.2. Objectives to be achieved through international cooperation are: outgoing mobility of students and teachers, organization of conferences with international partners, publishing papers as a result of international cooperation, participation in international projects, and professional development of postgraduates and postdoctoral scholars who complete some portion of their studies/careers abroad. The panel found that these activities have only been partly implemented. **Recommendation: The Faculty should continue with the implementation of its objectives so that students can complete some portion of their programmes abroad.**

6.3 The institution is planning to improve the quality of education by developing joint study programmes through its membership in international associations. Apart from few teachers who had the opportunity to spend a year or more at international universities, the rest of the teachers participated in short term study visits and did not gain enough experience to implement it in practice. **Recommendation: The Faculty should enable its teachers to gain working experience at international universities with specialized laboratories and finest equipment through formalised models of cooperation.**

- 6.4 In cooperation with the University of Applied Sciences in Slavonski Brod and GAMF Kecskemét College, the Mechanical Engineering Faculty in Slavonski Brod is a co-founder of the Association of International Team Society which organises the TEAM Annual Conference. Eight Faculty teachers are members of eight international associations from their fields of expertise. **However, the panel found that the involvement of the Faculty in international associations was still in its initial stage of implementation and that it should be intensified through various activities.**
- 6.5 The institution is planning to attract international students with incoming ERASMUS mobility. At the moment the Faculty is not offering courses in English but teachers are preparing teaching/course materials for teaching in English. **Recommendation: To invest additional efforts to attract international students.**
- 6.6 The Faculty is eligible to participate in the ERASMUS Programme, one of four sub-programmes of the Lifelong Learning Programme, until the academic year 2013/2014. The Faculty also has its academic and administrative coordinators for the Programme, and the Faculty Academic ERASMUS Coordinator has been appointed as the ERASMUS ambassador for Croatia for her efforts of promoting mobility in 2011. Although the panel favoured the Faculty's efforts regarding participation in the ERASMUS programme, **the suggestion for the Faculty would be to become involved in other Lifelong Learning Sub-Programmes, e.g. Leonardo da Vinci.**
- 6.7 The Faculty has developed other forms of inter-institutional cooperation. Individual cooperation of teachers of Mechanical Engineering Faculty Slavonski Brod with colleagues from the Mechanical Engineering Faculty, University of Maribor, and Hochschule Bremen in Germany has grown into inter-institutional cooperation. This cooperation has been formalised in bilateral agreements, bilateral projects and joint project applications within TEMPUS, FP6, and FP7 programmes. The Faculty is also involved in academic programmes which are associated with global corporations like Microsoft, Siemens, and Austrian AVL. This cooperation resulted in several donations of software that is being used in teaching and research.

7. Resources: administration, space, equipment and finances

7.1 The Faculty is spread over 4,500 square meters on three different locations. Two Faculty buildings are reserved for teaching and research activities, while laboratories are situated in the third building. According to these arrangements routine maintenance and refurbishing work is carried out and the resources provide satisfactory level of teaching, scientific and technical work. The Faculty has plans to raise a new building which would solve the problem of limited laboratory space and provide a classroom with 150 seats for students. The panel found the Faculty equipment unsatisfactory, especially with regard to the Faculty plans for further development. The Faculty offers the students a computer room for distance learning. Some classrooms are full, and other partially equipped with tools and design equipment. The library space is relatively small, with two computers for students. It can be said that the Faculty makes very good use of the existing resources. **Recommendation: To provide more group spaces for learning, especially in the library.**

7.2 The institution has fully developed rules which regulate the development of non-teaching staff and provide training opportunities in line with the mission of the institution. Non-teaching staff was trained during 2010 and 2011 in order to be able to efficiently work within the changing legislative and information technology frameworks.

7.3 The quality of laboratory equipment is appropriate for conducting regular activities. The equipment is purchased with the Faculty's own funds (tuition fees), and funds from scientific research and technology projects. The project documentation has been finished for the creation of the new Centre for Knowledge and Technology Transfer that should be built with the money from the state budget and pre-accession and structural funds. The Centre would serve as the basis for improving educational process and cooperation with the industry, which would result in securing funding for further development of the Faculty. **Recommendation: To make plans for systematic purchase of capital and sophisticated laboratory equipment used in scientific research. Since the equipment is very expensive and becomes obsolete quickly, due to the rapid technology development, this should not be done at the level of**

individual departments or chairs but at the level of the entire Faculty (in order to ensure the maximum utilisation of equipment).

7.4 The Faculty of Mechanical Engineering in Slavonski Brod provides the equipment and technical support for its use to ensure that all aspects of the organization can make the most of current and varied technologies. Computer equipment is installed in the server room, four computer classrooms, laboratories, teachers' and administrative staff offices. Both Faculty buildings are covered by local area network and wireless network. The Faculty is connected to the Internet via the CARNet network. The Faculty independently develops and maintains the basic Internet services: web (CMS System), digital repositories, and e-mail.

7.5 The Faculty collects, analyses and uses information relevant to the improvement of its activities. The Faculty management and the Committee for Quality Assurance meet at least once per year and evaluate the quality policy, i.e., discuss about its suitability and propose necessary changes. The quality policy is communicated to all Faculty staff. Well-established methodology and procedures are used for analysis of achieved objectives, and the results are communicated to all interested stakeholders.

7.6 Size, usability and availability of the library as well as the level of equipment only partially ensure adequate support to students in their learning and research. **Recommendation: To provide more spaces for learning and to increase the number of computers so that students have access to online databases.**

7.7 The Faculty has maintained the appropriate ratio of teaching and non-teaching staff (around 2.5:1).

7.8. Financial stability of the institution 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. **Recommendation: To take into account the possibility that the MSES will not be able to continue funding of scientific projects, this might lead to uncertain future for research funding. The panel suggestion for the Faculty would be to plan other sources of research funding.**

7.9 40% of income from tuition fees is used for improving Faculty activities, 5% goes to the University Development Fund, and the remaining 55% is used for covering the costs related to programme implementation. Other market income is distributed as follows: 10% for the improvement of the Faculty activities, 15% for covering material costs, 1% for the University, and 74% for direct costs of contracted market services. The Faculty management voices its concern that in case of the reduction in market income, the faculty would be unable to provide high quality teaching and research, and purchase equipment, teaching aids and software packages.

FINAL REPORT AND RECOMMENDATIONS OF THE EXPERT PANEL TO THE ACCREDITATION COUNCIL OF THE AGENCY

STRENGTHS

Study programmes

The organisation of study programmes enables vertical mobility of students, with possibilities of different study tracks, and possibility for students to participate in exchange programmes, as well as the arrival of international students from related faculties abroad. Graduate study programmes can be enrolled by students who completed university undergraduate or professional undergraduate programmes at other national or international higher education institutions. Transfer of students from other study programmes is possible under the condition that they take additional courses for the duration of one additional semester or one academic year. Students who complete graduate study programmes can continue with their studies in one of postgraduate study programmes offered by the Faculty or other national and international higher education institutions.

Student assessment

Teachers at a study programme assure that the assessment of student learning, regardless of its modality, is aligned with stated learning outcomes, that it represents the full range of learning being assessed, and assesses learning at the level of rigour appropriate to the qualification level. For the majority of courses, continuous assessment of learning is carried out. Students claimed that there were no surprises regarding exams and that the teachers provided them with the lists of materials for seminars and exams on time. In addition, the teachers also publish numerous textbooks which also help students considerably in preparing for exams.

Support of students

The Faculty has introduced a preparatory seminar for the first year undergraduate students in order to minimize the differences in prior learning between students, and to prepare them for lectures. During the preparatory seminar, students revise mathematics and

physics done at secondary school, and learn about the basic mechanical engineering terminology. The institution supports students in their extracurricular activities. The Faculty also financially supports its amateur rowing team, and two indoor soccer teams. The panel found students to be very satisfied with the level of support and engagement of teachers in their extra-curricular activities. The Faculty supports the work of the Student Council. One member of the Student Council is also a member of the Committee for Quality Assurance. During interviews with students, the expert panel was informed that their opinions were highly regarded by the Faculty management. Students also emphasised that they were directly involved in decision-making processes and even stopped the implementation of some Faculty decisions. The best students receive the Dean's Award, and best final and graduation theses get awards by the industrial partners.

Support of young scientists

The institution has developed a policy of encouraging academic publishing. Together with the Faculty of Electrical Engineering in Osijek and the Faculty of Civil Engineering, and supported by the University of Applied Sciences in Slavonski Brod, the institution publishes scientific-professional journal *Tehnički vjesnik* (A Category). The institution keeps track of multiple evidences of its scientific productivity. Comparative review of mechanical engineering projects in the Croatian Scientific Bibliography (CROSBI) indicates that three out of the top ten projects funded by the MSES and ranked by the number of published scientific papers, are coordinated by three teachers from the Faculty of Mechanical Engineering in Slavonski Brod. In line with its mission, the institution supports professional activities and services, ensures conditions for knowledge and technology transfer through the following activities: joint projects with the industry, organisation of professional conferences, summer schools, seminars, periodic laboratory analyses, and providing professional opinions and expertise.

Support of academic staff

Objectives to be achieved through international cooperation are: outgoing mobility of students and teachers, organization of conferences with international partners, publishing papers as a result of international cooperation, participation in international projects, and professional development of postgraduates and postdoctoral scholars who spend portion of their studies/careers abroad. By adoption of the Regulations on Rewarding Excellence of

Teachers and Staff at the Mechanical Engineering Faculty in Slavonski Brod awards will be given to teachers with best results from student questionnaires, as well as for publishing scientific papers, cooperating with the industry and participation in research and development projects.

International cooperation

The Faculty is eligible to participate in the ERASMUS Programme, one of four sub-programmes of the Lifelong Learning Programme, until the academic year 2013/2014. The Faculty also has its academic and administrative coordinators for the Programme, and the Faculty Academic ERASMUS Coordinator has been appointed as the ERASMUS ambassador for Croatia for her efforts of promoting mobility in 2011. The number of students involved in ERASMUS exchange has been growing since 2009. Individual cooperation of teachers of Mechanical Engineering Faculty in Slavonski Brod with colleagues from the Mechanical Engineering Faculty, University of Maribor, and Hochschule Bremen in Germany has grown into an inter-institutional cooperation. This cooperation has been formalised in bilateral agreements, bilateral projects and joint project applications within TEMPUS, FP6, and FP7 programmes. The Faculty is also involved in academic programmes which are associated with global corporations like Microsoft, Siemens, and Austrian AVL. This cooperation resulted in several donations of software that is being used in teaching and research.

Support of non-teaching staff

The institution has fully developed rules which regulate the development of non-teaching staff and provide training opportunities in line with the mission of the institution. Non-teaching staff was trained during 2010 and 2011 in order to be able to efficiently work within the changing legislative and information technology frameworks.

WEAKNESSES

Space

The Faculty is spread over 4,500 square meters on three different locations. Two Faculty buildings are reserved for teaching and research activities, while laboratories are situated in the third building. Since the Faculty does not have lecture room to accommodate large number of students, lectures for first year students are carried out in two shifts. Size, usability and availability of the library as well as the level of equipment only partially ensure adequate student support in their learning and research.

Work overload of teachers

Number and qualifications of the teachers are not fully in line with the Faculty's strategic goals. The Faculty does not have sufficient number of assistants. Although the average teacher-to-students ratio is favourable, it is much higher in the first year of studies. Some teachers do not have enough time to conduct their research because of various obligations related to teaching.

Laboratory equipment

The quality of laboratory equipment is appropriate for regular activities. Equipment is purchased with the Faculty's own funds (tuition fees), and funds from scientific research and technology projects. The panel found the Faculty equipment unsatisfactory, especially with regard to the Faculty plans for further development.

Mobility of teachers

Some of the mission objectives to be achieved through international cooperation, e.g. outgoing mobility of teachers and their stay at international higher education institutions, are in the initial stage of the implementation. The objectives are: outgoing mobility of students and teachers, organization of conferences with international partners, publishing papers as a result of international cooperation, participation in international projects, and professional development of postgraduates and postdoctoral scholars who complete some portion of their studies/careers abroad. These activities have only been partly implemented.

Mobility is carried out mainly through short-term visits of junior researchers and teachers to international universities within CEEPUS Programme. Long-term mobility is under-represented.

SUGGESTIONS FOR IMPROVEMENT

1) Institutional management and quality assurance

- The Faculty management should introduce measures to encourage researchers to apply for EU projects (especially FP7) and technological projects of the Croatian Institute for Technology in cooperation with the industry. This would result in securing project funding for the realisation of the Faculty's strategic goal to become a centre of excellence in education, research and professional activities in the field of mechanical engineering (Criteria 1.1.)
- In line with its mission, the Faculty should implement a vision which will ensure progress in all areas of its activities (Criteria 1.3.)
- The Faculty should consider reducing the teaching overload as soon as possible in order to give the teachers more time to focus on their research. It should also develop lifelong learning programmes. (Criteria 1.4.)
- To improve excellence in scientific research by attracting national and EU research funds (Criteria 1.6.)
- Teachers with poor questionnaire results should consider discussing the results with their students in order to find the reasons for the bad grades. If it proves that the low grades are justified, certain measures should be undertaken (Criteria 1.7.)
- The Faculty should develop measures to encourage mobility of teachers and junior researchers and publishing in international journals with high impact factors (and not limit itself to publications in national journals and conferences). Teacher work overload should be reduced so that enough time is left for research. The Faculty should ensure that young researchers spend part of their careers at international institutions (Criteria 1.8.)

2) Study programmes

- To distribute workload evenly between the teachers because at the moment it is obviously not balanced well. Additionally, many teachers work at the University of Applied Sciences in Slavonski Brod, which also increases their workload. The panel did not get information on the average teacher workload at the University of Applied Sciences in Slavonski Brod, and it remains unclear what the average teacher workload is (Criteria 2.2.)

- 1. To encourage actively the mobility of both teachers and students in order to improve the existing system and develop critical thinking regarding conformity of programmes to international standards. 2. The Faculty should create a special working group which will critically review all the study programs and compare them with the leading European and world technical universities (Criteria 2.6.)
- Students should be constantly reminded that studying is not just about passing exams, but also about developing creative thinking skills. The Faculty should provide separate room for learning where students would have better conditions for individual or group work. Two places in the library are far from adequate (Criteria 2.7)
- Teachers are recommended to improve teaching materials for their courses at the Faculty web site. The Faculty library should provide access to additional resources for students when preparing for examinations, seminar papers and graduate theses (Criteria 2.8.)
- Regarding the current economic situation in the region, additional efforts should be made to improve the cooperation with the industry (through joint projects and by ensuring that students apply previously acquired knowledge during internships). Students should also be involved in future projects with the industry (Criteria 2.9.)

3) Students

- Since the Faculty attracts students from five different counties, it is difficult to provide information to all. Thus, the panel recommends that it provides information packages for potential students on its web site with the information about the level of study programmes, qualifications, academic titles and possibilities for further education and employment (Criteria 3.1.)
- To intensify efforts to increase alumni participation in the Faculty Alumni Club as a basis for stronger collaboration with the industry not only in Slavonski Brod but also in other parts of the country (Criteria 3.10.)

4) Teachers

- Although the panel realises that the Faculty does not have direct influence on this criteria, its suggestion to the Faculty would be to undertake all possible measures to reduce the work load of overloaded teachers and to ensure that teachers have

enough time for their research. One of the recommended measures in order to decrease teaching load of teachers, the Faculty should hire external associates from the industry to hold exercises or/and utilize graduate students as tutors for undergraduates courses. (Criteria 4.1.)

- In order to avoid huge imbalance in the workload of young scientists, the Faculty should make additional effort to create conditions for their fast track advancement. Simulation should be done to show what would happen if all teachers above 60 were to retire (in which case regular implementation of study programmes could become problematic) (Criteria 4.2.)
- To make every possible effort to reduce teacher workload, including hiring external associates (Criteria 4.3.)
- To increase the participation in CEEPUS and ERASMUS programmes and other international scholarship schemes for long-term mobility of teachers in order to ensure their professional advancement (Criteria 4.5.)

5) Scientific and professional activity

- To increase participation in international projects, both as partners and coordinators, and secure funding for purchasing larger laboratory equipment. Considerable numbers of MSES projects are carried out by small groups of only two or three scientists from the Faculty. The Faculty should organise large research groups with identified priority areas of researches (Criteria 5.1.)
- To create an environment that would foster more possibilities for scientific research cooperation with respectable international research organisations (Criteria 5.2.)
- The Faculty should develop a mechanism for acknowledging and supporting scientific publication by the research staff in peer-reviewed journals with high impact factors. (Criteria 5.3.)
- Considerable effort should be made to encourage young scientists to establish more contacts with their international colleagues and gain research experience abroad (e.g. during writing doctoral theses or conducting postdoctoral research) (Criteria 5.4.)
- To publish papers not only in Croatian journals, but also in highly ranked international journals (Criteria 5.6.)

6) Mobility and international cooperation

- To make additional effort to increase internal mobility of students (Criteria 6.1.)
- The Faculty should continue with the implementation of its objectives so that students can complete some portion of their programmes abroad (Criteria 6.2.)
- The Faculty should enable its teachers to gain working experience at international universities with specialized laboratories and finest equipment through formalised models of cooperation (Criteria 6.3.)
- However, the panel found that the involvement of the Faculty in international associations was still in its initial stage of implementation and that it should be intensified through various activities (Criteria 6.4.)
- To invest additional effort to attract international students (Criteria 6.5.)
- The suggestion for the Faculty would be to become involved in other Lifelong Learning Sub-Programmes , e.g. Leonardo da Vinci (Criteria 6.6.)

7) Resources: administration, space, equipment and finances

- To provide more group spaces for learning, especially in the library (Criteria 7.1.)
- To make plans for systematic purchase of capital and sophisticated laboratory equipment used in scientific research. Since the equipment is very expensive and becomes obsolete so quickly, due to the rapid technology development, this should not be done at the level of individual departments or chairs but at the level of the entire Faculty (in order to ensure the maximum utilisation of equipment) (Criteria 7.3.)
- To provide more spaces for learning and to increase the number of computers so that students have access to online databases (Criteria 7.6.)
- To take into account the possibility that MSES will not be able to continue funding of scientific projects, which might lead to uncertain future for research funding. The panel suggestion for the Faculty would be to plan other sources of research funding (Criteria 7.8.)
- The panel suggests to the MSES to consider the development of the system for financial rewarding of teachers/researchers in order to encourage quality research of individuals.

