RE-ACCREDITATION OF THE FACULTY OF ELECTRICAL ENGINEERING AND COMPUTING UNIVERSITY OF ZAGREB

Date of the site visit:
26-27 April 2012

September, 2012

COMPOSITION OF THE EXPERT PANEL

Pursuant to Article 22 of the *Act on Quality Assurance in Science and Higher Education* and Article 30 Paragraph 1 Item 4 of the Statute of the Agency for Science and Higher Education, the Accreditation Council of the Agency for Science and Higher Education at its session on 20 March 2012 passed the decision to appoint panel of experts for re-accreditation of the Faculty of Electrical Engineering and Computing University of Zagreb composed of the following members:

- Prof. dr. sc. Ivo Ipšić, Faculty of Engineering, University of Rijeka
- Prof. dr. sc. Srete Nikolovski , Faculty of Electrical Engineering, University of J. J. Strossmayer Osijek
- Prof. Xin Yao, PhD, School of Computer Science, The University of Birmingham/The Centre of Excellence for Research in Computational Intel (CERCIA)
- Prof. Stefan Dickmann, PhD, Helmut Schmidt University Hamburg, Faculty of Electrical Engineering
- Davor Karlović, univ. bacc. ing. el., student, Faculty of Engineering, University of Rijeka

Expert panel was supported by:

- mr. sc. Sandra Bezjak, coordinator, Agency for Science and Higher Education
- Vlatka Derenčinović, prof., interpreter at the site visit and report translator, Agency for Science and Higher Education

Contents

INTRODUCTION

Short description of the evaluated institution

The historical development of the Faculty of Electrical Engineering and Computing University of Zagreb dates back to 1918 when the Technical College in Zagreb was founded. In 1926 the Technical College was transformed into the Technical Faculty and became a constituent of Zagreb University. The Faculty of Electrical Engineering was established in 1956 following a decision of the Croatian Parliament to transform departments of the Technical Faculty, University of Zagreb, into separate faculties. In 1995 the Faculty of Electrical Engineering changed its name to the Faculty of Electrical Engineering and Computing.

The Faculty consists of 12 departments. Departments are organizational units for coordination of research and teaching activities. The enrolment quota is 640 students. Annual graduation rate is around 550 students. The Faculty has 155 full time teachers and 149 associates.

FER offers to its students two undergraduate university study programmes (Electrical Engineering and Information Technology, and Computing), three graduate university study programmes (Electrical Engineering and Information Technology, Information and Communication Technology, and Computing), as well as one postgraduate university study programme and four postgraduate specialist study programmes (Transformers, Information Security, Regulation of the Market of Electronic Communications, and Electrical Engineering Systems in Railways).

The Faculty comprises of four buildings with offices for staff and classrooms/laboratories for teaching and research activities.

The work of the Expert Panel

The expert panel has, in line with the document *Procedure for Re-accreditation of Higher Education Institutions*, analysed the self-analysis document drafted by the Faculty of Electrical Engineering and Computing, University of Zagreb, and visited the institution on April, 25th and 26th 2012.

During the site-visit the members of the expert panel had separate meetings with the management, teachers, assistants, students, representatives of various committees and other staff and students, and had a tour of facilities (e.g. lecture rooms, library) in line with the previously defined Visit Protocol. These meetings gave the expert panel members a direct insight into the activities and work conditions at the Faculty of Electrical Engineering and Computing University of Zagreb.

DETAILED ANALYSIS BASED ON STANDARDS AND CRITERIA FOR RE-ACCREDITATION

1. Institutional management and quality assurance

1.1. FER has a clear Mission and Vision and a corresponding strategy based on 4 strategic goals:

- Development of educational activities
- Development of scientific research and professional activities
- Organization, operation and development of the faculty infrastructure
- Relationship with the environment.

These goals have been specified in detail, although the actual strategies for achieving such goals should be made clearer and more explicit. For its research, FER has defined 5 stategic areas: new energy sources and systems, transportation systems, medical technology, and information and communication technologies. It appeared from the communications with the FER leadership that the development of specific strategies to achieve the overall four goals was partially limited by FER's legal structure and the funding from the Ministry. **Nevertheless, it is recommended to define strategies, milestones and specific actions for the future. A set of indicators could be developed to partially measure the progress towards achieving the overall goals.**

1.2. FER is a large faculty with a mulitlevel structure, with a dean, 3 vice-deans, 12 departments plus several additional institutions such as library, administration and information support centre. Besides the 190-member Faculty Council, there are various other advisory bodies, committees and commissions. This stucture is very complex and its efficiency is questionable. To be efficient, it should allow for bottom-up decision making. The size of the Faculty Council probably does not allow its members to really contribute to the contents of decisions. **It is recommended to reconsider the organisational structure.**

1.3. The Faculty operates rather independently from the university, but as one of the university's largest and most respected faculties, it actively contributes to fulfilling the university goals.

1.4. All study programmes are aligned with the mission of the Faculty and provide qualifications that allow the graduates to successfully compete both on the national and international levels.

1.5. Each study programme offered by FER is aligned with the Baseline of the Croatian Qualifications Framework. The programmes have defined learning outcomes and were accredited previously.

1.6. The system of quality assurance has been defined and is in the process of being implemented. There is a Committee for Quality Management which co-ordinates, implements and develops the quality assurance mechanisms. **It is recommended to monitor the quality management by looking at specific issues and the way if and how the system can solve them. In particular, a clear mechanism should be developed to take student feedback into account in programme revision and lecture improvement. Such a mechanism should be made transparent to students and lecturers so that they are fully aware that their concerns, if any, are being addressed.**

1.7. FER has implemented very comprehensive formal mechanisms to monitor and improve teaching quality.

1.8. FER has implemented very comprehensive formal mechanisms to monitor and improve research quality, especially research outputs.

1.9. There is a Code of Ethics as well as two commitees and one advisory board dealing with ethics within FER.

1.10. The staff and the students are made aware of the rules for ethical behaviour.

2. Study programmes

2.1 FER determines its enrolment quotas "based on its experience from fifty five years old history, and taking into account the needs on the labour market for the profiles it educates, the number of educational and assisting staff and spatial and material Faculty capacity." (Page 45 of Self-evaluation) In other words, FER did consider the needs of society through "the needs on the labour market". It has considered the quotas carefully and has the education quality in mind, which is excellent. There have been tensions between the external pressure to increase FER's quotas, presumably because of the needs of the society, which goes beyond just the needs of the labour market, and FER's internal concerns about the limited resources (including human resources and the physical infrastructure) that are available. We fully agree that the education quality is paramount. There is a resource issue that must be resolved. Increased quotas should come with increased resources to ensure the quality of education provided to all students.

2.2 Given the existing quotas, FER is very well resourced in terms of teaching spaces, e.g., lecture rooms, teaching laboratories, etc. All teaching rooms that we visited are appropriately equipped. In general, the available resources for teaching are excellent. The Self-evaluation document discussed entry requirements and related figures in Section 2.3.2, but no figures were given for "the pass rate in the first year of study (undergraduate, integrated and professional)", as requested by the evaluation. **It is recommended that FER publish the pass rates in the first year of study (undergraduate, integrated and professional) for the last three years.**

2.3 There is a very good methodology for setting learning outcomes, which were described in the Self-evaluation document.

2.4 Learning outcomes for the study programmes and courses were set, which is excellent, although its implementation could be improved. At the moment, it is unclear how such learning outcomes were considered and used in the teaching process. For example, it is unclear whether there is a mechanism to ensure the examinations are assessing those learning outcomes. **It is recommended that FER develop a mechanism where learning outcomes are explicitly addressed in assessments, e.g., in exams and assignments. Such a mechanism and learning outcomes should be publicised to both lecturers and students.**

2.5 FER has set ECTS appropriately. Student workloads were monitored, e.g., through online student feedback.

2.6 The defined study programmes are comparable to international standards, as indicated by Self-evaluation and personal communications with the senior management team during the site

visit. All the staff members we met have a strong interest in benchmarking their work against international standards.

2.7 FER has some of the best faculty members in Croatia. All the teachers we met are excellent. They always encouraged their students to be autonomous and responsible learners. They were very enthusiastic about their work although we were a little surprised by a couple of departmental heads' attitude toward undergraduate teaching. It is clear that undergraduate teaching was not their highest priority. We were unable to observe any lectures or other teaching sessions because the visit was during the exam period.

2.8 Faculty members have tried hard to provide as much additional learning support materials as possible to students. The degree of such support varies from course to course. Some courses did not seem to have their own web pages. Lecture notes and other supporting materials are not always available online. The library seems to be very well run, but the number and quality of the books are rather limited, mainly because of a very small budget of 10.000 € per year. **It is recommended that FER (i) increase the library budget significantly to provide students with access to more and better textbooks, and (ii) provide online as much additional learning support materials as possible to students, e.g., lecture notes, additional reading materials, exercise/assignment questions, learning outcomes of the course, etc.**

2.9 In terms of research, FER has excellent links with industry. Such links also exist in teaching, but seem to depend heavily on individual lecturers. FER has had the summer industrial internship programme, which is an excellent way to enrich students' learning experiences and to prepare them for future careers. **It is recommended that FER actively promote and publicise such internship programmes to the students.**

2.10 The Self-evaluation document describes the formal mechanisms and steps for proposing, validating, approving and monitoring study programmes. The feedback from our site visit is that it was very time-consuming and difficult in practice to revise a study programme or set up a new one. Given the rapid changes in technologies, especially in information and communications technologies, it is essential that FER maintains a formal but efficient system in considering new and revising existing study programmes. **It is recommended that FER simplify the procedures for revising existing study programmes or setting up new study programmes. Such procedures should be publicised to all faculty staff members.**

3. Students

3.1. All information regarding student enrolment can be found at the Faculty web site https://www.fer.unizg.hr/upis/preddiplomski/uvjeti_upisa_201213. 'Booklet for the enrolment at undergraduate programmes', about the level of programmes, academic titles and information about enrolment can be accessed at the same address.

3.2. Admission criteria and procedures are publicly stated at the Faculty web-site, and constantly applied. They are also regularly reviewed for their effectiveness. Changes in the admission of students, that is, abolishing entrance exams and giving emphasis to secondary school grades and the results of the State Matura Exam, have also been analysed. Decline in the quality of enrolled students has been noted.

3.3. Traditionally, most successful high school students enrol at the FER. Those with best results in Mathematics and Physics were attracted to FER.

3.4. The institution supports students in their many extracurricular activities. Students are active in many organisations and student associations, such as: BEST (Board of European Students of Technology), e-STUDENT, Student Computer Club, student branch of IEEE (Institute of Electrical and Electronics Engineers), IAESTE (The International Association for the Exchange of Students for Technical Experience), and EESTEC (Electrical Engineering Students' European Association). All associations organize various activities like seminars, workshops, etc.

3.5. The institution offers mentoring for students enrolled in undergraduate and graduate programmes. Each student is appointed a mentor at the beginning of the third year of study to assist in their studies, particularly in relation to projects and final thesis. **It is recommended to develop student support and mentoring system in the first year of undergraduate studies and notify students about it.**

3.6. The Faculty monitors different aspects of the student life, like accommodation, extra-curricular activities, etc. It has shown its care for students' life, both academic and pastoral. The University and the Town are mainly responsible for provision of accommodation to students. The Faculty has done its best to increase the capacity and student flow in the student canteen.

3.7. The institution supports the work of the Student Council. The number of students' representatives in the Faculty Council is 15% of the total number of the Faculty Council members. The Student Council supports various student associations' activities. **Since the majority of the students are undergraduates and graduates, it is recommended that a president of the Student Council should also be an undergraduate or graduate student.**

3.8. The institution established methods and procedures for student assessment: homework assignments, seminar papers, mid-term exams, final exams, laboratory exercises, attending lectures, etc. Students are informed about these methods and procedures in the first lectures. They are also published at the Faculty web-site which provides feedback to students.

3.9. The institution keeps statistics on the employability of its graduates and uses the statistics from the Croatian Employment Service. It was mentioned during the site visit that the need for computer graduates has been increasing. However, the need for the electrical engineering graduates has been decreasing, which is directly related to the current situation in the industry (the recession). Regardless of that, the available statistics show that almost all graduates find employment. **To meet the new trend, it is recommended that the resource allocation within the FER, e.g., teaching staff recruitment, takes this trend into consideration.**

3.10. The association of FER graduate students, AMAC-Alumni, was founded in 2000. Its aim is to strengthen the ties and cooperation among former students and the Faculty through different activities, such as lectures and presentations. The Faculty alumni participate in the 50th anniversary of graduation celebration during which they are awarded with commemorative golden diplomas. The Alumni Club, a gathering place for former students, opened in 2010. Today the AMAC-Alumni has over 1000 members.

3.11. As previously mentioned, the number of students' representatives in the Faculty Council (15% of total membership) ensures their participation in the decision making processes of the

Faculty and in resolution of matters affecting their experience. The Student Ombudsman also facilitates communication between students and the Faculty.

3.12. The Faculty has a good reputation within the academic community and the industry and positive perception in the public. As the public institution serving the public interest, the Faculty informs the public of its activities through the media, individual announcements, regular and special publications, the Faculty web site, and the Faculty announcement boards.

3.13. Students can express their opinions and proposals for improvements through their representatives in the Faculty Council. They can also ask the Student Ombudsman for assistance. Furthermore, students can give comments or recommendations and express their opinions about the teachers in anonymous questionnaires.

3.14. It has been emphasised that the students are regularly informed about the measures implemented on the basis of their suggestions and opinions. However, a smaller part of the students, during the site visit, was not informed about the implemented measures**. It is** r**ecommended to develop more efficient system that would regularly inform the students about the measures implemented on the basis of their suggestions and opinions.**

4. Teachers

4.1. The qualification structure of teaching staff at the Faculty is adequate. The number of teaching assistants is not optimal, so all junior researchers have to participate in teaching. **It is recommended that the Faculty recruits more teaching assistants especially for courses with a large number of students (mathematics and computer science courses).**

4.2. The institution has a policy of growth and development of human resources. The fundamental problem with the human resources policy is the insufficient number of teaching assistants and junior researchers. Within the policy of human resources development there are no clear criteria for substituting retired professors. During the site visit, concerns were raised by the head of mathematics about the severe shortage of lectures in her discipline. **It is recommended that the faculty management accesses more strategically at the Faculty level the human resources problems.**

4.3. One of the major problems is the lack of teaching and academic staff in respective fields (mathematics, computer engineering). Since the Ministry cut down the number of PhD students the institution introduced a category of a young researcher financed from outside businesses. **It is recommended that FER further develops methods of cooperation with industry, where PhD students are supported by outside business.**

4.4. The Faculty employs a sufficient number of full-time teachers and the ratio between students and full-time teachers is satisfactory**, but it could be significantly improved if more associates with scientific-teaching titles would be employed.**

4.5. The institution has developed mechanisms for assessing the quality of the teaching staff via feedback from: student questionnaires, internal validation and self assessment of teachers at the course level. Unfortunately, there is no systematic care in the field of pedagogical education and

there is no systematic teacher training in the field of teaching methodology, didactics, psychology or pedagogy. There are no defined procedures of how student feedback will be taken into account in order to improve the teaching quality. **The recommendation is to consider student feedback with greater attention and inform the students about the procedure and outcomes considering their feedback.**

4.6. Procedures for teachers' advancement are implemented and accepted by employees.

4.7. The institution has developed models which guarantee fair workload distribution which considers only teaching. Lack of staff at the Department of Mathematics and the Department of Computer Engineering resulted in higher workloads at these departments. The institution has no policies regarding monitoring and balancing workload on research projects, number of mentorships, and other activities. **It is recommended that the institution should develop a model to solve the unbalanced workload of teachers and have systematic monitoring about the balance between teaching, research, mentorship and student consultations.**

4.8. The strategic policy of the institution ensures full commitment of all teachers to research responsibilities. It was clear from the site visit that some senior staff members did not attach equal importance to research and teaching. Undergraduate teaching was regarded as a lower priority than research. **It is recommended to ensure more commitment to undergraduate teaching.**

5. Scientific and professional activity

5.1. FER has very clear strategic goals. Strategic activities in the area of research in the next period are directed towards achieving the highest levels of teaching, research, and professional results and creation of the required institutional framework to achieve these goals.
Several identified research priority areas fit with the new EU Framework Programme for Research and Innovation - Horizon 2020.
It is recommended that FER focus more efforts on the implementation of its strategic goals.

5.2. FER's scientific research activities are focused in the field of technical areas of Electrical Engineering and Computing. There is strong encouragement from the Faculty to do high quality research and to cooperate with other scientific organisations and especially with Croatian industry.

5.3. FER has a great impact on Croatian society. It contributes to the society needs with educating PhD students in computing science. There is a high demand from the industry for such skilled human resources. In cooperation with local companies and government agencies, FER has developed a number of new products and services. Examples are new telecommunications services in collaboration with the company Ericsson Nikola Tesla and the Croatian Agency for Post and Electronic Communications (HAKOM), or improving the design of power transformers, as one of the most important export products, in cooperation with Končar - Transformers. FER also has excellent cooperation with SMEs on the creation of new products and services. This is implemented through a series of development projects supported by the Croatian Institute of

Technology (TEST program) and BICRO Agency (Proof of Concept Program under which the Faculty is leader of most projects).

5.4. FER has the document "Regulations on programs for the promotion of scientific research and innovations" which has been accepted by the Council. According to the document, program "FER-productivity", the financial support has been granted to FER researchers for publishing their work in high-ranking scientific journals according to Journal Citation Reports data base. The program encourages FER researchers to publish the scientific papers in prestigious, high ranking international journals with high impact factors. Although this is an excellent initiative that should continue, we believe there should be more dedicate support to young researchers.
It is recommended to set up special programmes to provide more tangible support to young researchers.

5.5. FER has introduced an excellent system of measures and several new committees for the purpose of evaluation of research activities of its researchers and inventing new ways to further improve the quality and quantity of scientific research work. The relevant FER committees are: Committee for Doctoral Studies, Committee for Research and International Collaboration, Committee for Industry Collaboration and Innovations, and Committee for Infrastructure and Operations. FER introduced several new measures for the recognition of research results achieved by researchers, which include five components targeted towards various types of research activities:

- *FER- Start* - the start-up funding program for new assistant professors with duration of two years;
- *FER- Financing* - the program for financial support of research projects, where FER provides its own funding for research programs that require participation in the total project cost;
-*FER-Productivity*- the program for recognition and awarding of publication productivity (journals ranked in Q1 and Q2 percentiles according to JCR database and patented innovations;
- *FER-Project*- the program for financial support of preparation of successful research project proposals;
- *FER-Success* - the program for recognition of successfully completed research projects.

It is recommended that a mechanism be put into place to monitor and review the effectiveness of these programmes.

5.6. FER has excellent program for promoting publishing of scientific journals. According to the "FER-productivity", the financial support has been granted to FER researchers for publishing their work in scientific journals ranked within before mentioned Q1 or Q2 quartile from Journal Citation Reports data base. The program encourages FER researchers to publish the scientific papers in prestige, highly ranked international journals with high impact factors. The new Regulations open space for better recognition of research excellence by giving out financial awards to researchers who publish their research work in top research journals that belong to Q1 and Q2 impact factor percentiles according to the Journal Citation Reports database. There is an impressive number of scientific publications of FER employees in the most prominent Journals in USA, EU and Japan.

5.7. FER has established a good system for monitoring their scientific productivity (research projects, scientific publications, patents etc.) but all these data are collected and stored at the other institution, the Institute Rudjer Boskovic. **It is recommended that the institution builds**

its own model for collecting this data so that researchers can access them at one place and save their time when preparing documentation for new projects.

5.8. FER has excellent cooperation with Croatian industry in a number of industry related professional projects. Most of the research at the Faculty is applied research for industry which is directly financed by Croatian companies according to a model in which a faculty employs doctoral students in full time employment during the project period. After acquiring a doctoral degree they are employed in that company, passing in this manner their knowledge and new insights, that are then converted into new products and, consequently, in new jobs with high added value. The Faculty particularly promotes this type of cooperation as a contribution to intellectual and economic development of the country.

6. International cooperation and mobility

6.1. The Faculty offers mobility for international students in accordance with Declaration of the Promotion of the University's Involvement in International Exchange Programs, and a number of international programs co-funded by the University of Zagreb are achieved. This primarily relates to the programs of incoming and outgoing student mobility, maintenance of existing agreements and the inclusion in the new international university networks. Student mobility at FER is carried out through the following programs:

- Erasmus
- Double Degree
- Erasmus Mundus
- CEEPUS
- Bilateral agreements

Regulations on undergraduate and graduate studies at the Faculty of Electrical Engineering and Computing stimulate that during the studies it is possible to transfer only once from another teaching institution to the FER. While the exchanges with overseas institutions are good, mobility of Croatian students among Croatian institutions should be improved.
It is recommended that the institution encourages students from other Croatian universities to enrol at their study programmes and set up flexible criteria for them.

6.2. Student mobility is one of the basic underlying ideas of the Bologna process and it is strongly supported by Faculty management and already implemented in the educational process. There is a special office (Office for International Collaboration and Projects), which serves all the students interested in spending a part of their study abroad. The Office acts primarily as a source of information and helps the students to enrol in appropriate foreign universities. The Office also encourages students to finish their studies at foreign universities. In addition, the students are supported by the Dean for Academic Affairs and five ECTS coordinators who check the compatibility of the courses at FER with the courses at the foreign universities.

6.3. FER has excellent results in the mobility of teachers and international cooperation and exchange with foreign universities and institutes. In the period 2006-2010, the Faculty Council of FER approved 32 research and training visits of FER's employees to international universities and institutes in duration of one year or longer. The number of approved short term visits in that time period was significantly higher. FER researchers were visiting respectable universities from

Austria, Belgium, France, Germany, Italy, the Netherlands, Singapore, Slovenia, Spain, Sweden, Switzerland, United Kingdom and USA.

6.4. FER employers have excellent involvement in a number of international associations such as: Association for Computing Machinery, Audio Engineering Society (AES), European Alliance of Medical and Biological Engineering and Science (EAMBES), European Association for Signal Processing (EURASIP), European Microwave Association (EuMA), European Nuclear Society (ENS), European Power Electronics and Drives Association, Power Electronics and Motion Control Council (EPE PEMC-C), European Society for Engineering and Medicine (ESEM), Information Risk Management and Assurance (IRMA), Institute of Electrical and Electronics Engineers (IEEE), International Association of Science and Technology for Development (IAESTED), International Council on Large Electric Systems (CIGRE), International Federation for Automatic Control (IFAC), TC Human-Machine Systems, International Federation for Medical and Biological Engineering (IFMBE), International Measurement Confederation (IMEKO), Laser and Electro-Optics Society (LeOS), Microwave Theory and Techniques Society (MTTS), Project Management Institute (PMI), Royal Institute of Navigation (RIN), Society of Motion Picture & Television Engineers (SMPTE).
Students are very active in IEEE student sections. The eSTUDENT student association has been founded with the objective of linking the best students of the University of Zagreb with the best companies operating in the Republic of Croatia.
The student association BEST Zagreb is a branch of the European Student Association. BEST offers students of the University of Zagreb possibilities of additional professional education, contact with future employers, work in international teams, development of organizational skills, and learning and understanding European cultures.
One of FER's professors is the Chairman of Region 8 of IEEE (Europe, Asia, Africa).

6.5. FER is doing much effort to establish teaching courses in English or other languages. In order to attract international students, the Faculty introduced the possibility of teaching courses in English in the academic year 2011/2012. The level of teaching in English differs for each course. The levels are:
- *Level 0:* The lecturer is not able to offer courses in English at this time.
- *Level 1***:** All teaching activities will be held in Croatian. However, foreign studentsin mixed groups will have the opportunity to master the course materials through additional direct consultations with the lecturer and teaching assistants in English. Additionally, the lecturer will refer foreign students to the corresponding literature in English, as well as give them the possibility of taking the associated exams in English.
- *Level 2:* In agreement with the students enrolled in the course, the lecturer will provide as many teaching elements in English as possible, or in both English and Croatian for mixed groups (i.e., bilingual teaching materials and bilingual exams). Level 2 also includes additional individual consultations with foreign students (as in Level 1) for the teaching elements which will be held in Croatian.
- *Level 3:* All teaching activities in the course will be held on English. This level includes courses with multiple groups (i.e., all teaching will be held strictly in Croatian for Croatian groups, and strictly in English for English groups).
It is recommended that the institution carries out study programmes in English at level 3, if possible, to attract more students from abroad in the future.

6.6. FER is very well involved in the EU Lifelong Learning Programme through international exchanges within the Erasmus Programme and BASILEUS/Erasmus Mundus External Cooperation Window - Lot 11 (Southeastern Europe countries).

6.7. FER has an impressive number of EU projects in relation to overall number of University of Zagreb projects. FER has 14 EU FP7 projects, 12 EU FP6 projects, 25 multilateral EU projects (COSTS, MIERS, CEEPUS, etc.), 26 bilateral international projects, 3 EU TEMPUS projects, and 69 national projects. Research and scientific activity of FER in this segment is truly impressive in Croatia.

7. Resources: administration, space, equipment and finances

7.1 In general, FER is excellently resourced in Croatia, including lecture rooms, laboratories, student canteens, student accommodation, etc.

7.2 Technical, administrative and other support staff is essential to the smooth functioning of a modern university. FER was asked to "Analyse the number of administrative, technical and supporting staff …" (Section 7.1 of Self-Evaluation). Such a number should have been provided. The analysis should have been carried out. During our site visit, it became clear that the number of administrative staff members is not the most important challenge. The skill level, including IT skills, of some staff members is. **It is recommended that FER develop an internal staff training programme for non-teaching staff members in areas such as IT skills and foreign languages (e.g., English). It is also recommended that FER strengthen its management of non-teaching staff members.**

7.3 The laboratories in FER are well equipped and comparable to the average European standard. There are a good number of computers for student use. There are also specialised research laboratories with good equipment.

7.4 The support to the use of equipments, including computers, is adequate. More resource sharing among different departments can be considered in the future to improve more efficient use of major equipments. It is unclear whether FER allow undergraduate students 24 hour access to computer laboratories. If not, it is recommended that FER consider offering 24 hour access to computer laboratories.

7.5 FER does not have an efficient central system for collecting and maintaining all necessary and accurate data. Many issues raised by FER during the site visit were related to the lack of such an efficient central system. **It is recommended that FER develop such a system, either externally or internally.**

7.6 The library staff is excellent and very enthusiastic about supporting research. The promotion materials there are excellent. However, the library is severely limited by its available resources, e.g., funding. **It is recommended that the budget for the library be increased significantly.**

7.7 The ratio of teaching versus non-teaching staff members in terms of numbers was appropriate although no concrete figures were presented during the site visit. Neither were such numbers available in the Self-evaluation document. The skill levels of non-teaching staff members, especially English and IT skills, can and should be improved. **It was recommended earlier in this report that an internal training programme should be set up.**

7.8 Financial stability is indeed harmonised with its mission and enables all students to graduate from their programmes. Transparency can be improved. For example, the Self-evaluation document presented incomes of FER in Table 7.9, but no figures were given about expenditures. Even heads of departments were unclear about FER's and their own department's financial situations, i.e., budgets. This makes any forward planning at the departmental level rather challenging**. It is recommended that a transparent financial model be developed to enable forward planning at both faculty and departmental levels.**

7.9 In addition to state funding, FER has generated additional incomes from its own activities, which is excellent. Such incomes have been used to improve the quality of teaching and scientific activities in line with the mission and other formal documents. **It is recommended that such information, i.e., spending on different activities, be made more transparent in the future.**

FINAL REPORT AND RECOMMENDATIONS BY THE EXPERT PANEL FOR THE ACCREDITATION COUNCIL

ADVANTAGES (STRONG POINTS)

1. Highly motivated and committed faculty management team, who wanted to develop the Faculty further in research, teaching and external services.
2. Strong efforts and encouragement, including financial incentives, for publishing papers in highly-ranked international journals.
3. Well qualified teaching and research staff.
4. Outstanding student intakes.
5. Excellent research links with Croatian industry.
6. Excellent teaching and research resources in Croatia.

DISADVANTAGES (WEAK POINTS)

1. Long-term strategies are not as clear and explicit as they could be. During the site visit, some staff members and students did not know what the strategies were.
2. The Faculty Council is too big to be an efficient decision-making body. While it is fully acknowledged that there are legal frameworks that FER needs to meet, it is nevertheless possible to develop a more efficient and transparent management structure that serves FER better and involves more staff members and students in the consultations and decision-making processes.
3. The resource allocation, especially human resource allocation, should be improved. For example, mathematics and computer engineering have a higher teaching load than others because of a large number of students and insufficient number of lecturers. Mathematics in particular is under-staffed.
4. The mechanisms and procedures for considering student's feedback should be made clearer to all students, to avoid or at least minimise the concern from some students that their repeated feedback about certain lectures were not taken seriously by FER and nothing was changed.

5. Transparency can be improved in management, including human resource and financial resource management.

RECOMMENDATIONS FOR IMPROVEMENT OF QUALITY

Management of higher education institution and quality assurance

It is recommended to define strategies, milestones and specific actions for the future. A set of indicators could be developed to partially measure the progress towards achieve the overall goals (1.1.).

It is recommended to reconsider the organisational structure (1.2.).

It is recommended to monitor the quality management by looking at specific issues and the way if and how the system can solve them. In particular, a clear mechanism should be developed to take student feedback into account in programme revision and lecture improvement. Such a mechanism should be made transparent to students and lecturers so that they are fully aware that they concerns, if any, are being addressed (1.6.).

Study programmes

It is recommended that FER publish the pass rates in the first year of study (undergraduate, integrated and professional) for the last three years (2.2.).

It is recommended that FER develop a mechanism where learning outcomes are explicitly addressed in assessments, e.g., in exams and assignments. Such a mechanism and learning outcomes should be publicised to both lecturers and students (2.4.).

It is recommended that FER (i) increase the library budget significantly to provide students with access to more and better textbooks, and (ii) provide online as much additional learning support materials as possible to students, e.g., lecture notes, additional reading materials, exercise/assignment questions, learning outcomes of the course, etc. (2.8.).

It is recommended that FER actively promote and publicise such internship programmes to the students (2.9.).

It is recommended that FER simplify the procedures for revising an existing study programme or setting up a new study programme. Such procedures should be publicised to all faculty staff members (2.10.).

Students

To develop student support and mentoring system in the first year of undergraduate studies and notify students about it (3.5.).

Since the majority of the students are undergraduates and graduates, a president of the Student Council should also be an undergraduate or graduate student (3.7.).

To meet the new trend, it is recommended that the resource allocation within the FER, e.g., teaching staff recruitment, takes this trend into consideration (3.9.).

To develop more efficient system that would regularly inform the students about the measures implemented on the basis of their suggestions and opinions (3.14.).

Teachers

It is recommended that the Faculty recruits more teaching assistants especially for courses with large number of students (mathematics and computer science courses) (4.1.).

It is recommended that the faculty management accesses more strategically at the Faculty level the human resources problems (4.2.).

It is recommended that FER further develops methods of cooperation with industry, where PhD students are supported by outside business (4.3.).

The Faculty employs a sufficient number of full-time teachers and the ratio between students and full-time teachers is satisfactory, but it could be significantly improved if more associates with scientific-teaching titles would be employed (4.4.).

The recommendation is to consider student feedback with greater attention and inform the students about the procedure and outcomes of considering their feedback (4.5.).

It is recommended to consider setting up an independent committee, with the chair and members from other faculties of the University, which considers potential appeals (4.6.).

It is recommended that the institution should develop a model to solve the unbalanced workload of teachers and have systematic monitoring about the balance between teaching, research, mentorship and student consultations (4.7.).

It is recommended to ensure more commitment to undergraduate teaching (4.8.).

Scientific and professional activity

It is recommended that FER focus more efforts on the implementation of its strategic goals (5.1.).

It is recommended to set up special programmes to provide more tangible support to young researchers (5.4.).

It is recommended that a mechanism be put into place to monitor and review the effectiveness of these programmes (5.5.).

It is recommended that the institution builds its own model for collecting this data so that researchers can access them at one place and save their time when preparing documentation for new projects (5.7.).

Mobility and international cooperation

It is recommended that the institution encourages students from other Croatian universities to enrol at their study programmes and set up flexible criteria for them (6.1.).

It is recommended that the institution carries out study programmes in English at level 3, if possible, to attract more students from abroad in the future (6.5.).

Resources: professional services, space, equipment and finances

It is recommended that FER develop an internal staff training programme for non-teaching staff members in areas such as IT skills and foreign languages (e.g., English). It is also recommended that FER strengthen its management of non-teaching staff members (7.2.).

FER does not have an efficient central system for collecting and maintaining all necessary and accurate data. It is recommended that FER develop such a system, either externally or internally (7.5.).

It is recommended that the budget for the library be increased significantly (7.6.).

It was recommended earlier in this report that an internal training programme should be set up (7.7.).

It is recommended that a transparent financial model be developed to enable forward planning at both faculty and departmental levels (7.8.).

It is recommended that such information, i.e., spending on different activities, be made more transparent in the future (7.9.).