Report
of the Expert Panel
on the Reaccreditation
of the University Postgraduate (Doctoral) Programme
Electrical Engineering and Information Technology

Date of the visit to the
Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture
University of Split:
September 21st, 2016

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INTRODUCTION

The Expert Panel appointed by the Agency for Science and Higher Education (ASHE) created this Report on the Re-accreditation of the University Postgraduate (Doctoral) Programme *Electrical Engineering and Information Technology* on the basis of the Self-Evaluation Report of the Programme, other documentation submitted and a visit to the University of Split Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture.

The Agency for Science and Higher Education (ASHE), a public body listed in EQAR (European Quality Assurance Register for Higher Education) and a full member of ENQA (European Association for Quality Assurance in Higher Education), re-accredits higher education institutions (hereinafter: HEIs) and their study programmes in line with the Act on Quality Assurance in Science and Higher Education (Official Gazette 45/09) and the Ordinance on the Content of a Licence and Conditions for Issuing a Licence for Performing Higher Education Activity, Carrying out a Study Programme and Re-Accreditation of Higher Education Institutions (OG 24/10). In this procedure parts of activities of higher education institutions and university postgraduate study programmes are re-accredited.

Expert Panel is appointed by the Agency's Accreditation Council, an independent expert body, to carry out independent evaluation of post-graduate university study programmes.

The Report contains the following elements:

- Short description of the study programme,
- The recommendation of the Expert Panel to the Agency's Accreditation Council,
- Recommendations for institutional improvement and measures to be implemented in the following period (and checked within a follow-up procedure),
- A brief analysis of the institutional advantages and disadvantages,
- A list of good practices found at the institution,
- Conclusions on compliance with the prescribed conditions of delivery of a study programme,
- Conclusions on compliance with the criteria for quality assessment.

Members of the Expert Panel:

- President of the Expert Panel, Dr. Gordon Dalton, University College Cork, Ireland,
- Prof. Daniele Nardi, Sapienza, University of Rome, Italy,
- Prof. Karol Kalna, College of Engineering, Swansea University, UK,
- Prof. Jens Grabowski, Georg-August-Universität Göttingen, Germany,
- Prof. Aurélio Campilho, Faculdade de Engenharia da Universidade do Porto, Portugal,
- Prof. Aurélien Francillon, EURECOM - Graduate School and Research Center in Communication Systems, France,
- Prof. Zoltán Fülöp, University of Szeged, Hungary,
- Giuseppe Moschetti, doctoral candidate, Huddersfield University, UK,
- Prof. Ove T. Gudmestad, University of Stavanger, Norway,

- Maximilian Lesellier, doctoral candidate, Robotique et de Microélectronique de Montpellier (LIRMM), France,
- Massimiliano Ferrucci, doctoral candidate, National Physical Laboratory, KU Leuven, Belgium,
- Prof. Hongming Xu, Department of Mechanical Engineering, University of Birmingham, UK,
- Prof. Vadim Silberschmidt, Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough University, UK,
- Prof. Sergey V. Utyuzhnikov, School of Mechanical, Aerospace and Civil Engineering, University of Manchester, UK,
- Stjepan Sučić, employer representative, Končar - inženjering za energetiku i transport, d.d., Croatia,
- Ana Carolina dos Santos Paulino, doctoral candidate, University of Strasbourg, France,
- Prof. Kjell Ivar Øvergård, Faculty of Technology and Maritime Science, University College of Southeast Norway, Norway,
- Prof. Aleksander Sladkowski, Silesian University of Technology, Poland,
- Prof. Stojan Petelin, univ. dipl. inž. stroj., Fakulteta za pomorstvo in promet, Univerza v Ljubljani, Slovenia,
- Hilde Sandhåland, doctoral candidate, Department of Maritime Studies, Stord/Haugesund University College, Norway.

The higher education institution was visited by the following Expert Panel members:

- Prof. Vadim Silberschmidt, Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough University, UK – moderator,
- Dr. Gordon Dalton, University College Cork, Ireland,
- Prof. Daniele Nardi, Sapienza University of Rome, Italy,
- Prof. Aurélien Francillon, EURECOM – Graduate School and Research Center in Communication Systems, France,
- Massimiliano Ferrucci, doctoral candidate, National Physical Laboratory, KU Leuven, Belgium.

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

- Dr. sc. Marina Matešić, coordinator, ASHE,
- Ivana Rončević, interpreter at the site visit and translator of the Report, ASHE.

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

- Management,
- Study programme coordinators,
- Doctoral candidates,
- Teachers and supervisors,

- External stakeholders,
- Alumni.

The Expert Panel also had a tour of the library, IT rooms, student register desk and the classrooms.

SHORT DESCRIPTION OF THE STUDY PROGRAMME

Name of the study programme contained in the licence: *Electrical Engineering and Information Technology*
Institution delivering the programme: Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture.
Institution providing the programme: University of Split
Place of delivery: Split
Scientific area and field: Engineering (Technical) Sciences, fields of Electrical Engineering and IT
Learning outcomes of the study programme: /
Number of doctoral candidates: 65
Number of teachers: 63
Number of supervisors: 34

RECOMMENDATION BY THE EXPERT PANEL TO THE ASHE'S ACCREDITATION COUNCIL

Upon the completion of the re-accreditation procedure and the examination of the materials submitted (Self-Evaluation Report, etc.), the visit to the higher education institution and interviews with HEI members in accordance with the visit protocol, the Expert Panel renders its opinion in which it recommends to the Accreditation Council of the Agency the following:

1. **Issue a confirmation on compliance** for performing parts of activities (renew the licence and label it as 'high quality').

RECOMMENDATIONS FOR THE IMPROVEMENT OF THE STUDY PROGRAMME
1. Consider combining two programmes to increase effectiveness and avoid duplication of processes.
2. Combine or group some of the courses into themes for easier course selection for incoming students.
3. To increase low quota of students, to improve outreach to industry, and to establish an industry advisory board, in order to increase the knowledge by industry of what the Faculty has to offer. Encourage industry to offer stipends.
4. To increase the low number of international students, advertise courses in English on the website and advertise that courses can be taught in English.
5. To improve internationalisation, more theses should be written in English, although the current percentage written in English was better than at most higher education institutions.
6. Apply for more H2020 projects in order to raise funds for the procurement of infrastructure and equipment.
7. Reduce teaching loads for both supervisors and faculty-funded students, which would allow them more time for research.

8. Reduce the number of ECTS for coursework, to enable more research to be carried out at an earlier stage. This would align the programme with other reputable institutions in Europe.
9. Improve the Faculty library facilities.
10. The Faculty should provide clearer statistics in future reports on:
    a. The number of students for Electrical Engineering and Computing.
    b. The number of Faculty-funded, self-funded and industry-funded students.
    c. Duration of the thesis for each category.

ADVANTAGES OF THE STUDY PROGRAMME
1. Coursework is research-oriented and wide in scope.
2. Students are satisfied with the courses provided and with personal consultations if the number of students is low.
3. Internationalisation is good, even excellent in some departments, with high impact and contacts in major labs in Europe.
4. Large number of labs and equipment. Greater industry participation could improve this further.

DISADVANTAGES OF THE STUDY PROGRAMME
1. Two programmes with same regulations, and overlap in courses. Possible duplication of workload and loss of efficiency.
2. Very large number of courses available can be confusing to incoming students.
3. Admission quota is low, due to geographic position in Croatia and downturn in local industry.
4. High teaching load of supervisors and faculty-funded students, as well as high ECTS course load for students, all of which reduces the research intensity of the programme.

EXAMPLES OF GOOD PRACTICE
1. Excellent preparation and presentation of the Self-Evaluation Report.
2. Research strategy report was excellent.
3. Good interest from the local industry.
4. Excellent international collaboration with major research institutions.
5. Promotion of both student and supervisor exchange and travel opportunities abroad.
6. Theses written in English.
7. Organization of many major international events: PhD forum, CERN, ICT, etc.

COMPLIANCE WITH THE PRESCRIBED CONDITIONS FOR THE DELIVERY OF A STUDY PROGRAMME

Minimal legal conditions:	YES/NO
1. Higher education institution (HEI) is listed in the Register of Scientific Organisations in the scientific area of the programme, and has a positive reaccreditation decision on performing higher education activities and scientific activity.	**YES**
2. HEI delivers programmes in the two cycles leading to the doctoral programme, i.e., first two cycles in the same area and field/fields (for interdisciplinary programmes), and employs a sufficient number of teachers as defined by Article 6 of the Ordinance on the Content of a Licence and Conditions for Issuing a Licence for Performing Higher Education Activity, Carrying out a Study Programme and Re-Accreditation of Higher Education Institutions (OG 24/10).	**YES**
HEI employs a sufficient number of researchers, as defined by Article 7 of the the Ordinance on Conditions for Issuing Licence for Scientific Activity, Conditions for Re-Accreditation of Scientific Organisations and Content of Licence (OG 83/2010).	**YES**
3. At least 50% of teaching as expressed in norm-hours is delivered by teachers employed at the HEI (full-time, elected into scientific-teaching titles).	**YES**
4. Student: teacher ratio at the HEI is below 30:1.	**YES**
5. HEI ensures that doctoral theses are public.	**YES**
6. HEI launches the procedure of revoking the academic title if it is determined that it has been attained contrary to the conditions stipulated for its attainment, by severe violation of the studying rules or based on a doctoral thesis (dissertation) that has proved to be a plagiarism or a forgery according to provisions of the statute or other enactments.	**YES**
Additional/ recommended conditions of the ASHE Accreditation Council for passing a positive opinion	
1. HEI (or HEIs in joint programmes) has at least five teachers appointed to scientific-teaching titles in the field, or fields relevant for the programme involved in its delivery.	**YES**
2. In the most recent reaccreditation, HEI had the standard Scientific and Professional Activity marked as at least "partly implemented" (3).	**YES**
3. The doctoral programme is aligned with the HEI's research strategy.	**YES**
4. The candidate : supervisor ratio at the HEI is not above 3:1.	**YES**
5. All supervisors meet the following conditions: a) PhD, elected into a scientific title, holds a scientific or a scientific-teaching position and/or has at least two years of postdoctoral research experience; b) active researcher in the scientific area of the programme, as evidenced by publications, participation in scientific conferences and/or projects in the past five years (table 2, Supervisors and candidates); c) confirms feasibility of the draft research plan upon admission of the candidate (or submission of the proposal); d) ensures the conditions (and funding) necessary to implement the candidate's research (in line with the draft research plan) as a research project leader, co-leader,	**YES**

participant, collaborator or in other ways; e) trained for the role before assuming it (through workshops, co-supervisions etc.); f) received a positive opinion of the HEI on previous supervisory work.	
6. All teachers meet the following conditions: a) holds a scientific or a scientific-teaching position; b) active researcher, recognized in the field relevant for the course (table 1, Teachers).	**YES**
7. The supervisor normally does not participate in the assessment committees.	**YES**
8. The programme ensures that all candidates spend at least three years doing independent research (while studying, individually, within or outside courses), which includes writing the thesis, publishing, participating in international conferences, field work, attending courses relevant for research etc.	**YES**
9. For joint programmes and doctoral schools (at the university level): cooperation between HEIs is based on adequate contracts; joint programmes are delivered in cooperation with accredited HEIs; the HEI delivers the programme within a doctoral school in line with the regulations and ensures good coordination aimed at supporting the candidates; at least 80% of courses are delivered by teachers employed at HEIs within the consortium.	-

	Quality assessment ("high level of quality" or "improvements are necessary") and the explanation of the Expert Panel
1. RESOURCES: TEACHERS, SUPERVISORS, RESEARCH CAPACITIES AND INFRASTRUCTURE	
1.1. HEI is distinguished by its scientific/ artistic achievements in the discipline in which the doctoral study programme is delivered.	**High level of quality** FESB has a good research record. In particular, the Self-Evaluation Report shows a large number of research projects, some of them also carried out at the international level. While the past achievements show a growing capability of fund raising, it is recommended that attention is given to further improve the acquisition of research funds, in particular, to support stipends of PhD students. In addition, the scientific activity is demonstrated by the organization of several international events and by significant networking with the international research community. The research is targeting internationally renowned publication venues and shows a good activity (see also 1.3). Cooperation with industry is supported by a large number of agreements. **Recommendation:** An outcome of the meeting with industrial stakeholders was that a more active cooperation is in order. For example, the creation of an industrial advisory board could support the development of the programme and offered courses as well as the suggestion of topics that are suited for industry-funded PhDs.
1.2. The number and workload of teachers involved in the study programme ensure quality doctoral education.	**High level of quality** The number of teachers is high, as compared with the number of candidates. Significantly more than 50% of the programme is delivered by its own faculty. The workload reported in the table shows a relatively high figure as compared with other Croatian universities. It is advisable that the working load and the mentoring of doctoral candidates is well-balanced, so to ensure a suitable quality of the teaching and enough time to mentor PhD students. PhD coursework is typically developed by teacher consultation, given the ratio of students/courses offered;

		Recommendation A more structured organization of the courses would contribute to improving the attractiveness of the programme for prospective students outside the Faculty.
1.3.	The teachers are highly qualified researchers who actively engage with the topics they teach, providing a quality doctoral programme.	**Improvements are necessary** Overall, the publication record indicates a good productivity, with a number of articles published in first-class publication venues. **Recommendation** The amount of publication activity shows a significant variance within the teaching body. This can possibly be improved by stimulating research activities, where they appear to be lacking (possibly by financing positions for PhD candidates in these areas).
1.4.	The number of supervisors and their qualifications provide for quality in producing the doctoral thesis.	**High level of quality** A good percentage of the teachers satisfies the requirements for mentoring PhD students, and, therefore, there is a sufficient number of potential supervisors at the PhD programme. Moreover, the figures about the actual supervisors in recent years indicate that the minimum requirement of 1:3 ratio supervisors/students is fully satisfied. **Recommendation** The table about student supervision should reflect the table about the teachers (in particular, highlight the respective numbers of PhD candidates in Electrical Engineering and in Computing).
1.5.	The HEI has developed methods of assessing the qualifications and competencies of teachers and supervisors.	**High level of quality** The PhD programme adopts internationally accepted practices for the evaluation of the qualifications of teachers and supervisors, based on their research excellence.
1.6.	The HEI has access to high-quality resources for research, as required by the programme discipline.	**Improvements necessary** The resources available in terms of laboratory space and equipment are remarkable and provide a suitable environment for conducting experimental research. **Recommendation** The structure of 83 laboratories appears to be too fine-grained to provide a clear picture of the on-going work. It is therefore recommended that the research activity is presented in a more structured form, by referring to

	research groups, their projects, research outcomes and affiliated PhD students and teachers. This would substantially contribute to increasing external visibility and attractiveness of the PhD programme.
	The library offers access to several scientific sources, including some Digital Libraries and a nice environment for study. Introduction of free access to the IEEE digital library would be appreciated by students and teachers.
2. INTERNAL QUALITY ASSURANCE OF THE PROGRAMME	
2.1. The HEI has established and accepted effective procedures for proposing, approving and delivering doctoral education. The procedures include identification of scientific/ artistic, cultural, social and economic needs.	**High level of quality** The submitted Self-Evaluation Report covers in a detailed way the procedures related to the launching of the programme, including an analysis of regional (economy, entrepreneurship, civil society, etc.) and national needs. All the documents governing the launching and approval processes of the doctoral programme are mentioned in the Self-Evaluation Report and were presented to the Expert Panel. The programme justification is well documented.
2.2. The programme is aligned with the HEI research mission and vision, i.e. research strategy.	**High level of quality** The programme of the postgraduate studies is aligned with the mission, vision and strategic goals of the Research Strategy of the Faculty and the University and follows suggestions of "Network of Higher Education Institutions and Study Programmes in the Republic of Croatia". Since the current strategy documents cover the periods until 2016 and 2017, respectively, a new set of documents is being developed. The Self-Evaluation Report discusses the alignment of the programme with the University's research focus (e.g., a special focus on renewable resources, especially solar and wind energy) and vision.
2.3. The HEI systematically monitors the success of the programmes through periodic reviews, and implements improvements.	**High level of quality** The Self-Evaluation Report and discussions during the on-site visit demonstrated that efficient implementation of the study programme is monitored actively, including various mechanisms: - Annual programme reviews before the start of an academic year; - Continuous monitoring of research productivity of both supervisors and PhD researchers involving the Committee for Postgraduate Studies; - Surveys of PhD students and graduates. Here, it is recommended to use anonymised questionnaires instead

	of current ones; - An analysis of the data collected by the University – currently, the main employer of the PhD graduates. The Committee for Postgraduate Studies takes the suggestions submitted as part of the above procedures into consideration trying to improve the programme.
2.4. HEI continuously monitors supervisors' performance and has mechanisms for evaluating supervisors, and, if necessary, changing them and mediating between the supervisors and the candidates.	**High level of quality** The Self-Evaluation Report contains most of the requested data on performance of supervisors that is monitored systematically, based on the annual evaluation of their research performance, including a number of papers published together with their PhD researchers. The Report also contains highly detailed information on the procedures for changing supervisors and mediating between the supervisors and the candidates if needed. Data on the changes of supervisors is also provided together with the explanations of reasons for such changes (mostly due to retirement). An interesting and commendable feature in a regular assessment of supervisors is inclusion of their assessment by their PhD researchers, using a special form.
2.5. HEI assures academic integrity and freedom.	**Improvements are necessary** The University and Faculty have procedures to assure academic integrity based on the Code of Ethics adopted in 2010. It provides the main definitions and a description of academic ethical values. There is a procedure in place for revoking a PhD degree in cases of plagiarised or falsified research results. The main form of work on plagiarism prevention is via collaboration of PhD researchers with their supervisors when preparing manuscripts for submission to journals that is mandatory for progression. The texts of all doctoral theses are published on the Faculty's web site. **Recommendation** Based on discussions with current PhD researchers, an introduction into the use of, and access to, anti-plagiarism software is recommended for inclusion in training of PhD students.
2.6. The process of developing and defending the thesis proposal is transparent and objective, and	**High level of quality** The Self-Evaluation Report contains detailed information on procedures for producing and defending a thesis (including references to sections and articles of respective

	includes a public presentation.	regulatory documents). It covers conditions and a procedure for submitting a proposal of the doctoral thesis as well as descriptions of a commission and a procedure for accepting this proposal. A 3- to 5-member strong committee should contain at least one member from outside of the university; in some cases this member is from abroad. The forms of the proposal defence protocol and proposal assessment were provided together with their recent examples as part of the full sets for some of the recent PhD researchers. The templates of the documents are also available online.
2.7.	Thesis assessment results from a scientifically sound assessment of an independent committee.	**High level of quality** The Faculty developed detailed procedures for thesis assessment that are described in their respective regulations. These regulations i.a.: - Provide an opportunity to write and defend a thesis in a foreign language; - Allow various forms of a thesis – a monograph or a collection of published papers with respective additions (introduction, discussion etc.); - Define conditions for submitting a thesis (including requirements for at least one internationally peer-reviewed paper published in a specified type of journal and presentation at an international academic conference with publication in its proceedings); - Describe procedures for assessing and defending a thesis (including a requirement of translation of the assessment into English in a case of foreign members of the commission). All the regulations (together with the respective templates) are published and were available to the Expert Panel alongside with the documents from recent defences.
2.8.	The HEI publishes all necessary information on the study programme, admissions, delivery and conditions for progression and completion, in accessible outlets and media.	**High level of quality** The Faculty uses its e-learning portal to inform applicants and PhD researchers about main features and procedures of the postgraduate research programme. It includes main regulatory documents, guidelines on various procedures related to the studies and all the templates necessary for implementation of the required procedures by PhD researchers and their supervisors. This portal also has information on the study programme, admission to it and its delivery as well as conditions for progression and completion of studies.

2.9. Funds collected for the needs of doctoral education are distributed transparently and in a way that ensures sustainability and further development of doctoral education (ensures that candidates' research is carried out and supported, so that doctoral education can be completed successfully).	**Improvements are necessary** Funding of postgraduate studies is based on several sources, including research projects and tuition fees. The income from the latter is allocated following the regulations for the use of revenues of public HEIs: 40% for improvement of research activities and 60% for other expenses (including teaching and assessment and defence of theses). The structure of costs and expenses was provided in the Self-Evaluation Report. **Recommendation** Some deficit of the programme is covered by the Faculty "from other sources". Although such commitment is commendable, an increase in the number of PhD researchers could not be sustained in this way. So, it is recommended for the Faculty to increase their efforts in attracting other funds. One opportunity, that the Faculty already participates in, is application for European grants with dedicated funds for support of PhD researchers. The Faculty could also better use the existing links with industry for attracting additional funds, or in-kind support.
2.10. Tuition fees are determined on the basis of transparent criteria (and real costs of studying).	**High level of quality** The Self-Evaluation Report provides the details on the basis for calculation of tuition fees. It also mentions the main sources of tuition fees (for instance, all the candidates employed as teaching assistants at the Faculty – a large cohort of the PhD researches – have their tuition fees covered by the Faculty). The level of the tuition fees is monitored and compared with those for comparable study programmes in the region. **Recommendations** Still (see also 2.9), a deficit of the current funding regime should be considered for a potential increase in the level of tuition fees to cover fully the real costs of the programme.
3. SUPPORT TO DOCTORAL CANDIDATES AND THEIR PROGRESSION	
3.1. The HEI establishes admission quotas with respect to its teaching and supervision capacities.	**Improvements are necessary** The HEI has established an admission quota of 25 candidates per academic year, taking into account the number of supervisors, their capacities, and their teaching workload. At the moment, the number of admitted candidates is well below the quota. The average number of

	candidates per supervisor is 1.9, which is below the recommended 3:1 ratio. Table 2 (Supervisors and candidates) at the end of the Self-Evaluation Report indicates that one supervisor has 6 candidates. **Recommendations** While the average number satisfies the recommended conditions, the Panel suggests that the HEI pay particular attention to the progress of the candidates being supervised by a mentor who has more than 3 candidates. The rights and obligations of supervisors and candidates are clearly defined in the Regulations on Postgraduate Studies.
3.2. The HEI establishes admission quotas on the basis of scientific/ artistic, cultural, social, economic and other needs.	**High level of quality** The HEI has developed admission policies based on an assessment of technological development and needs of society for PhDs in the STEM area. In the past five years there were 46 PhD graduates, none of whom are unemployed. 39 of these graduates are employed in education, research, and development in the public sector, while the remaining 7 are employed in research and development within the private sector. The HEI has organized several events in which industry are invited to learn about the research endeavours being carried out by PhD candidates. The Panel commends the HEI for their proactive stance on outreach to industry.
3.3. The HEI establishes the admission quotas taking into account the funding available to the candidates, that is, on the basis of the absorption potentials of research projects or other sources of funding.	**High level of quality** Currently, the research of all PhD candidates is funded by national, international, or institutional projects. 89% of PhD candidates' research is funded by institutional (faculty) research projects, while 18.5% of research candidates are funded by national and international research projects. The discrepancy in the percentage is due to co-funding of some national projects by institutional projects. 37% of current PhD candidates are self-funding the tuition costs, while the rest are either co-funded or fully funded by the HEI, research projects, or other institutes. **Recommendations** The Panel suggests that the HEI reduce the number of self-funded candidates by seeking additional sources of funding, for example international research projects.
3.4. The HEI should pay attention to the number of candidates admitted as to	**High level of quality** Upon application to the PhD programme, potential

provide each with an advisor (a potential supervisor). From the point of admission to the end of doctoral education, efforts are invested so that each candidate has a sustainable research plan and is able to complete doctoral research successfully.	candidates are tasked with identifying a research area and a potential supervisor from a list pre-populated for the given academic year by the Committee for Postgraduate Studies. Once accepted, the candidate and their supervisor decide the courses that the candidate will take to prepare them for performing the PhD research. Annual reports are submitted by the supervisor on the progress of the candidate's PhD studies. The Committee for Postgraduate Studies reviews these reports to monitor the candidate's ability to complete their thesis successfully and on time. The Expert Panel found in their site visit that communication between candidates and their supervisors occurs weekly if not daily. The high frequency of these interactions is a positive indication of the HEI's efforts to ensure the successful completion of doctoral research.
3.5. The HEI ensures that interested, talented and highly motivated candidates are recruited internationally.	**High level of quality** The HEI advertises their call for applications on their website, organizes dedicated public events such as the Festival of Science and Faculty Day, and publishes in the press to inform the public about their PhD programmes. Teachers provide the best Master's students with information about the doctoral programmes. More recently, the HEI has developed a programme to ensure that the five best students from their graduate studies are admitted as assistants in postgraduate doctoral studies. The HEI additionally has collaboration agreements with private companies that employ students. These agreements typically consist of joint research endeavours and joint conferences. By taking part in the Erasmus Mundus programme, one student from another Western Balkan country is being hosted at the HEI. Additionally, in the past five years, nine students from Western Balkan countries were accepted into the postgraduate studies programme at the HEI. A thorough English version of the HEI's website has been developed to attract applicants from abroad. The HEI allows theses to be written in English, which also helps to attract foreign applicants. **Recommendations** Formalizing the teaching of courses in English and advertising this will strengthen the HEI's ability to incentivize foreign students to apply.
3.6. The selection process is public and based on choosing the best applicants.	**High level of quality** The HEI makes a public announcement of the call for applications on their website, in the press, and at events.

	The website provides a detailed overview of the various steps an applicant must take to submit a complete application. The HEI considers the applicant's past academic performance, research activities, scientific publications, and recommendations from teachers and the supervisor the applicant selects in the application. Interviews and consultations are held prior to a decision being made on the acceptance of the candidate.
3.7. The HEI ensures that the selection procedure is transparent and in line with published criteria, and that there is a transparent complaints procedure.	**High level of quality** The HEI publishes a public call for applications to the postgraduate study programme on their website and in the press. The HEI has established a thorough selection procedure that details considerations of applicants with varied academic and scientific backgrounds. The list of admitted applicants is published on the HEI's website. Rejected applicants may lodge a complaint to the HEI and receive a prompt response. Appeals to decisions made by the Dean can be submitted to the Faculty Council.
3.8. There is a possibility to recognize applicants' and candidates' prior learning.	**High level of quality** In addition to the thorough considerations of prior achievements established in the selection procedure, the HEI has a mechanism for formal recognition of learning from other PhD study programmes, a candidate's Master's degree, and scientific publications in the field of study. In the case that a candidate has prior learning that is related but not exactly the same, the HEI provides candidates the opportunity to still be credited by taking a supplemental exam that will bridge the gap between the prior learning and the required competence for the PhD study. In the case that a student has previous scientific achievements, for example publications, the HEI may consider these achievements in lieu of PhD coursework.
3.9. Candidates' rights and obligations are defined in relevant HEI regulations and a contract on studying that provides for a high level of supervisory and institutional support to the candidates.	**High level of quality** The HEI has a publicly available document that details the rights and obligations of PhD candidates. Candidates are made aware of the rights and obligations in a meeting with the Committee for Postgraduate Studies shortly before the start of the first semester. The document lays out all the critical milestones in a candidate's PhD study and details the requirements for coursework, doctoral qualification exam(s), thesis topic proposal, etc. Candidates are required to submit annual reports to provide the HEI with feedback on the progression of the PhD study programme. Candidates are allowed to request a change of supervisor.

	Additionally, in the case the candidate cannot finish their PhD studies on time, the HEI has established formal request mechanisms for extending the studies one year at a time. The HEI has also implemented learning agreements, which will be signed by the candidates and which establishes a formal declaration of a candidate's rights and obligations.
3.10. There are institutional support mechanisms for candidates' successful progression.	**Improvements are necessary** In their admission procedures, the HEI takes into account the number of research projects at its disposal and ensures that all candidates partake in one of these projects. The Panel observed in their site visit that the work by PhD candidates and their supervisors is of high quality and that publication in conference proceedings and scientific journals is encouraged and supported. Additionally, during the interviews with current candidates, the Panel found that the HEI is very proactive in the internationalization of candidates by either supporting secondments abroad or attendance of international conferences and seminars. **Recommendations** In some instances, candidates were being tasked with research projects that were not directly contributing to the progression of their PhD thesis topics. It would be helpful to ensure that a candidate's PhD thesis topic is directly or closely aligned with the research project he or she is tasked with.
4. PROGRAMME AND OUTCOMES	
4.1. The content and quality of the doctoral programme are aligned with internationally recognized standards.	**Improvements are necessary** The programme which was presented to the Expert Panel meets the international standards, and in particular the requirements at European level as well as the CroQF. While the programme is of a high level of quality, some improvements are possible. In particular, the Panel makes the following recommendations: FESB should aim for a better industry involvement. While the local industry still needs to develop and the FESB already organizes some events, further cooperation is possible. For example, in defining some research topics or funding projects, or joint submissions, e.g., in H2020. **Recommendations** The comparison to other programmes internationally in Figure 4.1 is very well done and detailed. However, a few

	things are missing, for example it would have been nice to compare the effective durations of PhD theses (and not only the minimum durations). In general too few statistics are provided, or they are aggregated values which are difficult to interpret. This comparison also highlights the larger than usual number of courses and seminars to attend at FESB when compared to other international programmes. FESB requires 30 ECTS, while University of Ljubljana requests 20 ECTS and EPFL 12. Likewise, the number of seminars students need to attend is significant. Fortunately, such courses are research-oriented and given as consultations. Self-funded students seem to be able to finish in 3 years but students with a teaching load or an industry job seem to have difficulties to free enough time to do their research and therefore it often takes very long to complete the research work. It is unclear how 3 years of effective independent research can be performed if an important part of the time is spent on attending classes, teaching, unrelated project work and sometimes a day job. It would be interesting to better track typical time allocation between actual research work and other activities.
4.2. Programme learning outcomes, as well as the learning outcomes of modules and subject units, are aligned with the level 8.2 of the CroQF. They clearly describe the competencies the candidates will develop during the doctoral programme, including the ethical requirements of doing research.	**High level of quality** The FESB provides a very large list of courses with a small number of students. While it may be an option to reduce the number of offered courses, this allows to have more focused lectures on advanced topics. Furthermore, this allows having lectures which are given in the form of a seminar, and such courses can therefore contribute directly to research work. Learning outcomes are described in the Section 4.2 of the Self-Evaluation Report but in a very general way. Ethical issues are addressed through several means, in particular, through seminars or consultations. It is also argued that non-plagiarism is ensured by publishing in international journals. However, it must be clear that such a peer review should not be used as a check for plagiarism but only as an indicator. The use of a plagiarism check tool on the thesis before its publication may ensure absence of any plagiarism. Most PhD theses from recent years are available online (at https://elearning.fesb.unist.hr/mod/page/view.php?id=53 696) which makes them easily accessible and allows them to be indexed in full text by tools such as Google Scholar. Unfortunately, while browsing this list it is not clear which

	theses are in English or in Croatian, as only the Croatian titles are provided.
4.3. Programme learning outcomes are logically and clearly connected with teaching contents, as well as the contents included in supervision and research.	**High level of quality** Students were generally satisfied with the teaching and the supervision. Table 4.2 highlights well how the programme outcomes are connected to different seminars and courses. However, it should be ensured that the PhD topic is defined early enough to ensure that students can follow courses which are relevant to the thesis.
4.4. The doctoral programme ensures the achievement of learning outcomes and competencies aligned with the level 8.2 of the CroQF.	**High level of quality** A set of theses was provided to the Expert Panel. The programme results, in particular the publications in international venues and journals, attests that novel research is performed, which fulfils the main competence expected at the level 8.2 of the CroQF. In addition to this a minimum of publications is mandatory (one journal and one international conference) which guarantees a minimum level of research work to be performed before graduation. **Recommendations** While this is a simple way to ensure reaching these criteria, it may sometimes lack flexibility and may also risk delaying unnecessarily the completion of studies. Another common bias of such a minimum requirement is that it may encourage publishing in weaker venues or journals on the lists of indexed journals, where chances of acceptance are higher. In particular, it is noteworthy that, according to table 4.1, EPFL has no formal rule on this aspect.
4.5. Teaching methods (and ECTS, if applicable) are appropriate for level 8.2 of the CroQF and assure achievement of clearly defined learning outcomes.	**Improvements necessary** All activities relating to the PhD (courses, seminars and research) are well organized and are all integrated in the ECTS system. This provides a clear overview of the expected work to complete the PhD. The Panel understood during its visit to FESB that courses are research-focused and have, generally, few students registered which allows delivering them as consultations and, therefore, as a research activity. **Recommendations** Courses could be better spread over the duration of the PhD, as this would free time in the first year of the PhD to start working early on the research topic. This would also

	allow selecting courses later, when the thesis work is clearer. This in particular would allow selecting courses which are more in line with the research conducted, e.g., bridging some gaps in a particular field or broadening the scope of the research to nearby topics.
	The Panel recommended to reduce coursework ECTS number requirement from 30, to align it with other international institutions (e.g. those listed as examples in the Self-Evaluation Report).A lot of information is available about the courses on the e-learning portal (https://elearning.fesb.unist.hr), however, most of the information on the public site is provided in Croatian which hinders possible international student enrolment.
4.6. The programme enables acquisition of general (transferable) skills.	**High level of quality** The programme includes seminars which are focused on transferable skills, and therefore fulfils those requirements. In semesters 4, 5 and 6, a generic skills seminar can be selected instead of a research seminar. **Recommendations** It is however not clear if there are any general guidelines on how many such generic skills seminars needs to be selected or what is the actual number of such seminars selected by students.
4.7. Teaching content is adapted to the needs of current and future research and candidates' training (individual course plans, generic skills etc.).	**High level of quality** Courses are provided with flexibility, all courses are elective and a large number of courses are provided which gives freedom to students in choosing the courses which are most relevant to their thesis.
4.8. The programme ensures quality through international connections and teacher and candidate mobility.	**Improvements necessary** The programme includes faculty which has graduated abroad or had international experience. Table 4.4 provides some data about internationalization. A significant number of students were able to conduct part of their research in foreign institutions (36%). **Recommendations** Eventually few of the students chose to write the theses in English (15%). Furthermore, on average, students attended more than 3 international conferences. Some co-advised theses with universities outside of Croatia show active and lively international cooperation. It is however surprising that only 4 students participated in international projects

	as there are multiple projects presented in section 1.1. Also there are very few international teachers in the programme. The programme should aim at increasing the number of theses in English and forms of international cooperation.

* NOTE: RECOMMENDATIONS OF THE EXPERT PANEL TO THE ASHE'S ACCREDITATION COUNCIL AND QUALITY LABEL

The role of the Expert Panel in the re-accreditation of doctoral study programmes is manifold. The Expert Panel or part of the Expert Panel visiting a higher education institution drafts a report on the basis of a self-evaluation report, the accompanying relevant documentation, and a site visit to HEI. The draft report is adopted by all members of the Cluster Expert Panel, while the president of the Cluster Expert Panel is responsible for coordinating the assessment levels.

The report contains an assessment on whether a doctoral study programme delivered at a higher education institution complies with the prescribed laws and by-laws, as well as any additional/recommended requirements defined by the Agency's Accreditation Council, and whether a higher education institution can obtain a positive, i.e. satisfactory quality assessment according to the criteria set out in this document. Moreover, the Expert Panel must make recommendations for quality improvement.
Based on the assessment of all these elements, the Expert Panel may propose to the Accreditation Council of the Agency to issue either a confirmation on compliance, a letter of expectation for the period up to three (3) years in which period the higher education institution should eliminate the identified deficiencies, or to deny the license.

If the Expert Panel has assessed that a doctoral study programme delivered by a higher education institution does not meet legal and other requirements or that the quality of a study programme is not ensured (i.e. that HEI does not meet additional requirements or recommendations made by the Accreditation Council, or has a very poor quality assessment), they should propose to the Accreditation Council to deny the license.

If the Expert Panel considers that the relevant laws and bylaws have been met by a higher education institution, but that certain elements mentioned above do not meet the quality requirements, while they consider that the identified shortcomings can be corrected within a time frame of three years, they should issue a letter of expectation.

If the Expert Panel considers that all legal and additional/recommended requirements have been met and the quality assessment is satisfactory, i.e. that a study programme fulfils the learning outcomes appropriately defined for that level and scientific area, they may propose the issuance of a certificate and have a HEI commit to quality improvement and reporting to the Agency during the follow-up period.

Finally, if the Expert Panel has, in accordance with the criteria mentioned above, proposed issuing the certificate of compliance and assessed that, in addition to meeting the minimum quality requirements – i.e. the qualification framework level - for a study programme, the programme should be identified as a doctoral programme of a 'high level of quality', the Expert Panel may propose to the Agency's Accreditation Council that such a doctoral study programme be awarded the 'high quality label'. Thus the Agency, with the consent of the Accreditation Council, grants a higher education institution the right to use the label for their academic and promotional purposes.
The 'high quality label' cannot be proposed or awarded to a programme or a higher education institution that does not comply with the requirements laid down by the laws and bylaws mentioned in this document, and any additional requirements recommended by the Accreditation Council. Moreover, the quality assessment awarded to a study programme should reflect a high level of quality inasmuch that at least half of the sub-criteria in each of the quality assessment criteria are assessed as

being of high quality. The Accreditation Council of the Agency issues a final opinion on the label awarded. The content and form of the quality labels shall be prescribed by the Agency in a relevant general act.

The Accreditation Council of the Agency discusses the final report with all recommendations and suggestions, and issues their opinion on the report. Based on a prior opinion of the Accreditation Council, the Agency issues an Accreditation Recommendation to the minister responsible for science and higher education, and upon receipt of the minister's final decision on the outcome of the procedure, awards the 'high quality label" to a higher education institution.