ASIIN Seal

Accreditation Report

Bachelor's Degree Programme
Ba Automatic Control and Electronics,
Ba Computing and Informatics,
Ba Power Engineering,
Ba Telecommunications

Provided by
University of Sarajevo

Version: 28 June 2019

Table of Content

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for [1]	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[2]
Ba Automatic Control and Electronics		ASIIN, EUR-ACE® Label	ASIIN, 2012-2017	02, 04
Ba Computing and Informatics		ASIIN, Euro-Inf® Label,	ASIIN, 2012-2017	02, 04
Ba Power Engineering		ASIIN, EUR-ACE® Label	ASIIN, 2012-2017	02, 04
Ba Telecommunications		ASIIN, Euro-Inf® Label,	ASIIN, 2012-2017	02, 04
Date of the contract: 22.09.2017 **Submission of the final version of the self-assessment report:** 29.01.2018 **Date of the onsite visit:** 08.-09.03.2018 **at: Sarajevo**				
Peer panel: Prof. Dr. Rüdiger Reischuk, University Lübeck; Prof. Dr. Ulrich Petri, University of Applied Sciences Ulm Dr. Muamer Bezdrob, PING				
Representative of the ASIIN headquarter: Dr. Martin Foerster				
Responsible decision-making committee: Accreditation Commission for Degree Programmes				

[1] ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes; Euro-Inf®: Label European Label for Informatics

[2] TC: Technical Committee for the following subject areas: TC 02 - Electrical Engineering/Information Technology; TC 04 - Informatics/Computer Science.

Criteria used: European Standards and Guidelines as of 15.05.2015 ASIIN General Criteria, as of 10.03.2015 Subject-Specific Criteria of Technical Committee 02 – Electrical Engineering as of 09.12.2011; Technical Committee 04 – Informatics as of 09.12.2011	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF[3]	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Ba Automatic Control and Electronics	B.Sc.		6	Full time		6 Semester	180 ECTS	Winter semester; Winter Semester 2005/06
Ba Computing and Informatics	B.Sc.		6	Full time		6 Semester	180 ECTS	Winter semester; Winter Semester 2005/06
Ba Power Engineering	B.Sc.		6	Full time		6 Semester	180 ECTS	Winter semester; Winter Semester 2005/06
Ba Telecommunications	B.Sc.		6	Full time		6 Semester	180 ECTS	Winter semester; Winter Semester 2005/06

For the Bachelor's degree programmes in Automatic Control and Electronics, Computing and Informatics, Power Engineering and Telecommunications the institution has presented the following profile in the self-assessment report:

„Electrical Engineering is among the most exciting and challenging areas of engineering, and a key discipline in a highly technological society. Electrical, electronic, computer and information technology engineers have been driving the evolution of technology by being able to effectively apply fundamental concepts and integrate knowledge from various disciplines while pursuing frontier research, creating new ideas and innovations, and designing and developing new products.

The University of Sarajevo, Faculty of Electrical Engineering has been delivering programmes in the field of electrical engineering for fifty years (since 1961). The Faculty of Electrical Engineering employs faculty members, who are well respected in their areas of

[3] EQF = The European Qualifications Framework for lifelong learning

research and education. They engage in research activities encompassing wide range of areas such as applied mathematics, information systems; electromagnetic and electric measurements, electric machines, automation and control, power systems, telecommunication systems, electronic systems, information processing, software and computer engineering, computer and intelligent systems, radio communications and microwaves, networking and protocols, etc.

Nowadays, the field of electrical engineering has expanded far beyond its historical roots to encompass almost any area of engineering activity that depends on electrical phenomena. Information technology, broadly defined to include computers, data networks and communication systems, as well as the supporting technologies required to sense, process, store and display information, has come to have a dominating influence on electrical engineering. On the other hand, growth in the information technology depends strongly on continued innovation in all major areas of electrical engineering, which is in turn dependent on advances in information technology that provide tools necessary to enable this innovation.

Canton Sarajevo Law on Higher Education defines the educational and scientific role of the University of Sarajevo. The mission of the University of Sarajevo is to achieve excellence in its efforts to prepare its graduates not only to practice their professions in the respective fields, but also to participate as valuable and useful member of society with a social conscience, in national and international affairs.

The Faculty of Electrical Engineering Sarajevo (ETF Sarajevo) is equally dedicated to the advancement of knowledge through excellent teaching, research and graduate education. According to the “Act of the competence’s establishing” adopted by the Senate of the University of Sarajevo, the ETF Sarajevo participates in the University development and is responsible for the implementation of the University’s mission in the area of electrical engineering.

ETF Sarajevo is offering bachelor’s degree programmes in Automatic Control and Electronics, Computing and Informatics, Electrical Power Engineering, and Telecommunications.“

C Peer Report for the ASIIN Seal[4]

1. The Degree Programme: Concept, content & implementation

Criterion 1.1 Objectives and learning outcomes of a degree programme (intended qualifications profile)

Evidence:

- Self-Assessment Report
- Website of the degree programmes (accessed 05.04.2018):
  - Automatic Control and Electronics: http://www.etf.unsa.ba/index.php?id=375
  - Power Electrical Engineering: http://www.etf.unsa.ba/index.php?id=376
  - Computing & Informatics: http://www.etf.unsa.ba/index.php?id=377
  - Telecommunications: http://www.etf.unsa.ba/index.php?id=378

Preliminary assessment and analysis of the peers:

For all study programmes, the HEI presented a detailed description of general learning outcomes in the self-assessment report (SAR). All information are simultaneously presented on the programmes' websites online assuring that all stakeholders interested in the programmes can easily access these information. The peers approve that for each programme a detailed presentation of learning outcomes is given in the SAR in combination with learning outcome matrices matching the described learning outcomes with the respective modules of the programmes. Thus, it is clear that all students shall have the fundamental knowledge needed for a career in electrical engineering with certain specializations according to the respective degree programmes. They will also develop appropriate communication skills, understand the ethical and professional responsibilities of their discipline and acquire the basis for life-long learning being enable to continue their studies on a Master level after graduation. All graduates are enabled to work individually as well as in teams on

[4] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

practical and research projects, possess presentation skills and have the ability to communicate their research results to the interested public.

In the programme, Automatic Control and Electronics (ACE) students will gain fundamental knowledge and understanding of the appropriate mathematical and natural science principles underlying conceptual basis in control systems theory, as well as electronic circuits. They also have a sound knowledge and systematic understanding in the fundamentals of electrical engineering, physical phenomena and system dynamics. They possess the ability to identify, formulate, analyse and solve medium complexity engineering problems, understand design methodologies especially in control systems and electronics and can design and use appropriate mathematical methods or information technology tools for current projects.

In the programme Computing and Informatics, students develop sound knowledge and systematic understanding in the fundamentals of electrical engineering, informatics and programming as well as the ability to identify, analyse and solve medium complexity engineering and informatics problems. They are able to select and apply relevant analytic and modelling methods and can quickly adapt to new working environments in companies from the IT sector as well as in other private and public companies. Further, students are conveyed the competence to design and develop hardware, software and take part in system integration of information and process control systems as well as to understand all phases of the information system and software life cycle including an understanding of design methodologies in computation and informatics.

In Electrical Power Engineering (EPE) students additionally to basic mathematical and electrical engineering knowledge students also are conveyed knowledge and systematic understanding in the fundamentals of informatics as well as a deeper understanding of the fundamentals of electrical power engineering. Graduates are able to apply their knowledge and understanding to identify, formulate, analyse and solve medium complexity engineering problems in the field of electrical power engineering and have an understanding of design methodologies in the field. They can easily familiarize with new trends and products, have an understanding of the engineering practice and characteristics of materials, techniques and methods and can implement theoretical knowledge and understanding to gain practical skills necessary to solve problems in electrical engineering.

The programme Telecommunications conveys fundamental knowledge in mathematics and natural sciences as well as electrical engineering and informatics. Further, students gain deeper knowledge in the subject-specific electronics in telecommunication, electromagnetic fields and theory of information, signals and systems. They can apply this knowledge to identify, formulate and solve medium complexity engineering problems in

telecommunications and can develop and realize designs to meet defined and specified requirements by clients. Graduates possess an understanding of design methodologies in electrical engineering, they are acquainted with research practice and can combine theory and practice to solve telecommunication problems.

A corresponding Master programme that is not to be accredited at this time follows each Bachelor programme. In the discussions, the faculty said that these programmes have still to be updated and improved. The peers encourage the faculty to speed up this process and get an accreditation for the Master programmes as well in the near future.

In conclusion, the peers agree that all programmes adequately reflect the ASIIN Subject-Specific Criteria as well as the EQF-level 6 for Bachelor programmes. For the programmes in Computing and Informatics and Telecommunication they also declare that the criteria of the Euro-Inf® Label (European Informatics) and for the programmes ACE and EPE the criteria of the Eur-Ace® Label (European Engineers) are met. The peers confirm that the Euro-Inf® and Eur-Ace® Framework Standards regarding the intended learning outcomes are fulfilled for the Bachelor Programmes in line with the Bologna Declaration.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment Report

Preliminary assessment and analysis of the peers:
The panel considered the names of the study programmes to be adequately reflecting the respective aims and learning outcomes.

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report
- Annex 2: Module Handbooks
- Website of the degree programmes (accessed 05.04.2018):
    - Automatic Control and Electronics: http://www.etf.unsa.ba/index.php?id=375
    - Power Electrical Engineering: http://www.etf.unsa.ba/index.php?id=376
    - Computing & Informatics: http://www.etf.unsa.ba/index.php?id=377

- Telecommunications: http://www.etf.unsa.ba/index.php?id=378

- Discussions during the on-site-visit

Preliminary assessment and analysis of the peers:
The curricula of all study programmes under review were being reviewed by the panel in order to identify whether the described learning objectives can be achieved by the available modules. Course descriptions as well a programme syllabus is also presented on the website of each programme thus easily accessible to all stakeholders.

The peers understood that for all programmes the first year of study is nearly identical only with slight variations in the Computer and Informatics (CI) programme. These changes are generally part of the modifications in the CI programme undertaken after the previous accreditation. The panel very much approved of the changes initiated in this procedure. Thus, in the first semester all students gain fundamental knowledge of mathematics, physics, electrical engineering and computing with more detailed courses on these subjects in the second semester. The variation in the CI programme for the second semester consists of the introduction of three elective courses apart from Mathematics and Programming Techniques where students can choose some more subject-specific offers.

In the second year of ACE, students broaden their knowledge in mathematics and electrical engineering while specific topics in the field of control systems and electronics are being introduced in the form of electives so that students can set an individual emphasis. These specializations are further developed in third study year while students also gain some practical experience (Laboratory work in Automation or Electronics) before the programme is ended by the bachelor thesis in the sixth semester. After evaluation the curriculum the peers were convinced that the most important aspects are covered and that students gain an adequate knowledge in the field. However, they expressed that contents of High Frequency Electromagnetic Interference could still be strengthened.

In CI the second year is similarly used to deepen the students' knowledge in mathematics, electrical engineering and especially computer science and information technology (Computer Architectures, Fundamentals of Computer Networks, etc.). The third year offer opportunities to specialize in certain fields individually through a high number of elective courses. In general, the peers approve of the significant increase of electives in the programme that ensures a broad approach to up-to-date aspects of the subject. The programme ends with the final project in the sixth semester.

The programme EPE follows in the second year the same course as the other programmes with more focus on contents of mathematics, electrical engineering but also principles of

economy (Engineering Economic). At the end of the fourth semester the first electives are introduced allowing for individual specializations. There is more rooms for such specializations in the third study year where also more practical issues are conveyed (Lab. Work in Electrical Power Engineering 1, Electrical Machines). As in the other programmes a final project end the programme in the sixth semester.

Finally, in Telecommunications the second study year is also used for the deepening of understanding in mathematics and electrical engineering, while students also get introduced to principles of telecommunication theory, techniques and systems (Information Theory and Source Coding, Telecommunication Techniques 1, etc.). Within the third year of the study programme, slight specializations are introduced by corresponding mandatory and elective modules before the degree is competed by the Bachelor thesis in the sixth semester. As with the ACE programme the peers would recommend for this programme a strengthening of aspects of High Frequency Electromagnetic Interference but were otherwise satisfied with the conveyed knowledge and implementation of the programme learning outcomes.

In conclusion, the peers realized that significant modifications have been undertaken since the previous accreditation which were considered laudable especially in the IC programme. Students have a good variety of elective courses and gain sufficient practical experience to start a successful career after completing their studies. One minor point raised by the peers concerned the conveyance of individual presentation and research skills since these are not mandatory elements of the existing courses. Students can choose individually to take such courses in the open electives at some stage of their curricula but this is not compulsory. With a view to the quality of the Bachelor theses and their defense the peers consider it helpful to introduce such a course or at least to integrate such elements into already existing modules in a mandatory way. Further, it could be helpful to strengthen the co-operation with other faculties in order to offer subject-related courses of non-technical skills such as technical English.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report
- Faculty website for enrolment policy (accessed 05.04.2018): http://www.etf.unsa.ba/index.php?id=125
- Discussions during the on-site-visit

Preliminary assessment and analysis of the peers:

From the documentation presented the peers understood that entry requirement for applicants for the First Cycle Study at the Faculty of Electrical Engineering Sarajevo (ETF) is graduation from the four year secondary school. To ensure that school graduates have the appropriate knowledge needed to participate in the study process, all candidates are ranked according the entrance test in mathematics. Candidates are graded according to their results achieved in the entrance test, success in secondary school and results achieved in science competitions. Approximately, the first 100 applicants on the ranking list are admitted and fully supported by the Ministry of science, education and sports of the Canton Sarajevo. Other applicants can also be admitted, but are participating in the costs of study. The Canton Sarajevo Government also determines the number of those applicants who are admitted as self-paying students. In general, the interest in the study programmes is extremely high and Government requests are to accept ever more students in order to meet the demands from industry. Nevertheless, the peers could well understand the arguments presented by the faculty management that for more than the already accepted students the current capacities are not suitable and an extension of working space would be needed.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 1:

The peers uphold the recommendations regarding the introduction of a module in form of a seminar in preparation of the bachelor thesis but generally consider this criterion to be largely fulfilled.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Report
- Annex 2: Module Handbooks
- Website of the degree programmes (accessed 05.04.2018):
    - Automatic Control and Electronics: http://www.etf.unsa.ba/index.php?id=375

- Power Electrical Engineering: http://www.etf.unsa.ba/index.php?id=376
- Computing & Informatics: http://www.etf.unsa.ba/index.php?id=377
- Telecommunications: http://www.etf.unsa.ba/index.php?id=378

- Discussions during the on-site-visit

Preliminary assessment and analysis of the peers:
All study programmes under review are divided into modules which comprise a sum of teaching and learning. The panel found the structure of the modules in general to be adequate and manageable.

As already described, the curricula offer a good variety of electives as well as practical aspects that are well structured in order to prepare students for their professional career as well as to allow for individual specializations with a view to further Master studies. While the working practice is part of many module in all curricula it became clear that especially in the programmes of EPE and Telecommunication some of the heavy machinery and required equipment are not available at the university. While is not in general a restriction to the programmes themselves the possibility exists that students become acquainted with such equipment during internships and short visitations where they can gather work experience. Although many students do already participate in such internships the peers recommend to further improve and institutionalize the communication of possible internships to the students so that everyone is informed about the existing options.

The modules range in their structure usually from 4 to 7 credits totalling up to 180 credits per degree programme. Each semester comprises 30 ECTS credits. The Bachelor thesis is awarded 12 ECTS credits. While the peers had a very good impression of the level of knowledge reflected in the exams reviewed during the on-site-visit the level of some of the Bachelor theses was not as high as might have been expected, in particular in the Informatics programme. The peers encourage the programme coordinators to work on improving measures in order to make sure that the high quality of learning and teaching is reflected in the outcome of all final projects and matches international standards. This should be accompanied by introducing the aforementioned compulsory module on academic research and presentation.

Apart from this aspect the peer agreed that both practical experience as well as academic depth effectively support the learning progress of the students and that the programmes' structure is adequate to achieve the previously defined learning outcomes.

International mobility is still developing at the University of Sarajevo although there are already more than 100 international cooperation agreements and even more institute partnerships. Currently 15 students of the faculty were studying abroad supported by the office

for international cooperation and funded by resources from Erasmus+. Scholarship programmes are also supported in cooperation by international embassies but the programme coordinators still see room for improvement on this level. In any case, the peers positively took note of the many co-operations already in existences and the active participation of students as well as teaching staff. The recognition process for the acknowledgement of competencies gained at foreign universities is well defined and the students know about it. Previous to leaving the university a learning agreement is signed indicating which courses will be acknowledged which is done after the comparison of the described learning outcomes of the respective courses. If courses cannot be acknowledged this needs to be justified by the responsible university committee. Consequently, the peers see that the acknowledgment regulations for international mobility are in accordance with the Lisbon convention.

Criterion 2.2 Work load and credits

Evidence:

- Self-Assessment Report
- Module Handbooks
- Audit discussions

Preliminary assessment and analysis of the peers:

All modules are assigned with ECTS credits amounting to 30 credits each semester. Consequently, the workload is equally distributed over six semesters. Each credit point amounts to 25 hours of student workload. The workload is controlled through questions in the surveys at the end of each semester but the discussion with the students revealed that they are generally content with the workload as it is. The distribution of ECTS credits thus seems to be reasonable in relation to the actual workload of the students. However, as will be discussed in more detail elsewhere, the application of the evaluation surveys seems not to be as strict as might be and participation from students is very low. Consequently, through motivating students to participate more actively in the survey results in the workload may also be more precise and allow for a continuous review. Nevertheless, the panel was convinced by the discussion with teaching staff and programme coordinators that the workload is being evaluated and the changes in the modules were being considered if the students expressed criticism.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Report
- Audit discussions

Preliminary assessment and analysis of the peers:
It has already been outlined that teaching in the four programmes includes theoretical foundations as well as practical work, which was welcomed by the peers. In general, teaching includes lectures, classroom exercises, tutorials, group exercises, laboratory work, group and individual projects as well as seminars. The peers took positive note of the established connections with local industry that are made use of in order to enhance the practical aspects of teaching. Thus, industry representatives are regularly invited to give lessens or presentations as part of the existing courses at the faculty giving students the possibility to get in contact with real work life. Consequently, the teaching methodology was considered up-to-date and adequate in order to convey the contents envisaged by the programmes.

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Report
- Audit discussions

Preliminary assessment and analysis of the peers:
The peers had a very good impression of the offers related to support and assistance of the students at the Faculty of Engineering. The students confirmed that the teaching staff is always available to any questions and supports the students in every possible way. Similarly, student societies (for example the Embedded Systems Club) offer opportunities to use free time on the premises of the faculty for individual projects for which a few rooms are open to student use. However, the students expressed their wish to have more such rooms for individual and group work which are still limited due to space restrictions. Information about the courses, modules and study programmes in general are presented on the website but all parties involved agreed that this could be reviewed and much improved in order to convey the most important information in easily accessible way. While the peers

clearly saw that all essential information are online, they learned from the students that many of them considered the website difficult to manage and hard to find the information one needed. Therefore, they deem it helpful to re-design the web appearance of the programmes thus improving the transparency and visibility of the programmes. Apart from these technical issues, during the whole visit the peers got a great impression of the drive of staff and students that perfectly underlined the outstanding reputation of the degree programmes in the country.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 2:

The peers still consider the assurance of an appropriate academic level of all Bachelor theses as well as the other minor points mentioned above to be of high importance. Apart from this, they consider the criterion to be largely fulfilled.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Self-Assessment Report
- Module Handbooks
- Audit discussions

Preliminary assessment and analysis of the peers:

Each course-content in the reviewed study programmes is reflected in exams which are distributed in three examination periods each semester, the first and second midterm exams and the final examination period. The generally high amount of exams during one semester was not considered to be problematic but helpful in the eyes of the students since it allowed for continuous evaluation of each student individually. Re-sit regulations for failed exams are determined by law; for every final exam there are two make-up exam opportunities. The students expressed criticism that some of the finals exams especially in mathematics are not well-balanced. Thus, the focus of the exams was laid primarily on correct calculations without giving credit to the right way of solution. During the discussion with the teaching staff this issue was raised and the peers expressed the importance of designing exams in a way that they examine the basic competencies of the module. Thus,

solutions with minor mathematical errors should be judged appropriately, still giving credit to generally correct proceedings.

The peers checked a variety of exams and agreed that they all represented an adequate level of knowledge as represented by the EQF-Level 6. However, as has been discussed before, the scientific work presented in the Bachelor theses was not always on an appropriate level. It appeared that skills in individual research, discussion of literature and analysis of experiment results could still be enhanced. The peers encouraged the programmes co-ordinators to strengthen these aspects in the existing modules or even to introduce a new type of seminar where it is guaranteed that each student is involved in some kind of individual literature research and presentation of experiment results.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 3:

The peers consider this criterion to be largely fulfilled.

4. Resources

Criterion 4.1 Staff

Evidence:

- Self-Assessment Report
- Audit discussions
- Staff Handbook
- Staff members on the website (accessed 06.04.2018): http://www.etf.unsa.ba/index.php?id=831

Preliminary assessment and analysis of the peers:

Along with the information in the SAR the HEI presented lists of staff members and their research areas for all study programmes. On this basis, the peers were convinced that the number of staff assigned to the programmes was sufficient to properly sustain them. The teaching staff is well qualified and the general teaching load of ten hours per week is reasonable. However, during the discussion with the teaching staff, the peers learned, that in many cases lecturers often have to work more. On a voluntary basis they can work up to sixteen teaching hours a week thus increasing their regular income. But in many other cases teaching assistants have to take a high number of lab classes which are valued at a different

ration thus increasing their regular teaching load significantly. Both students and teaching staff would welcome the employment of more lab assistants (that could also be advanced students) in order to offer lab classes more flexibly and at the same time reducing the work-load of the teachings staff. Another aspect apparent from the documents was a certain difference in the student-teacher-ration between the varying programmes. Although the ratio in general was all right compared with international standards it was apparent that especially the CI programme with a higher number of matriculating students had a quite disproportionate ratio. In this programme there are currently 10,4 students per teacher while the other programmes do no exceed 4,6 students per teacher. This disparity should be balanced according to the peers in order not to create a disadvantage for the students.

Criterion 4.2 Staff development

Evidence:

- Self-Assessment Report
- Audit discussions

Preliminary assessment and analysis of the peers:
The most important measures of staff development that were made known to the panel are based on offers of international mobility. Through the Erasmus+ programme and a significant number of partnership agreements many members of the faculty make use of the opportunity to spend some time at foreign universities doing research and informing themselves about innovative teaching methods. Most active are partnerships with institutions in Dublin and Braunschweig where several staff members had already spent time and profited greatly according to their own report.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment Report
- Audit discussions
- On-site-visit

Preliminary assessment and analysis of the peers:
The programmes' funding come partly from government funds and partly from student fees, given that about half of the matriculating students are self-paying. Nevertheless, the financial resources of the faculty are limited in comparison with other European institutions. However, the peers were impressed in how far the equipment and appearance of the programmes had already improved since the previous accreditation. The equipment is suitable to carry out Bachelor programmes although, as has already been mentioned, the equipment in EPE and Telecommunication could still be enhanced. Since this is not a necessity or a requirement for the success of the programmes the students could well get acquainted with this kind of equipment during internships and work practices. It could be helpful if the faculty would improve the communication of such offers ensuring that all students are informed about these opportunities.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 4:

The peers consider this criterion to be largely fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Module Handbooks
- Website of the degree programmes with links to module descriptions (accessed 09.04.2018):
    - Automatic Control and Electronics: http://www.etf.unsa.ba/index.php?id=375
    - Power Electrical Engineering: http://www.etf.unsa.ba/index.php?id=376
    - Computing & Informatics: http://www.etf.unsa.ba/index.php?id=377
    - Telecommunications: http://www.etf.unsa.ba/index.php?id=378

Preliminary assessment and analysis of the peers:
The peers appreciated the module descriptions presented beforehand with the self-assessment report and noted positively that they are also accessible online via the degree programmes' websites. It was given credit to the fact that the descriptions have significantly

improved in the aftermath of the previous accreditation and that they now give full information about the courses, examinations, contents, learning outcomes and recommended literature. One minor issue were the module descriptions in discrete mathematics and mathematical logic and probability theory that raised the impression of content overlaps. From the discussion with the teaching staff it became evident that this is not actually the case but, hence, the peers recommended to update these descriptions according to their current content.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Website for ECTS Documents with exemplary Diploma Supplement (accessed 09 April 2018): http://www.etf.unsa.ba/index.php?id=385
- Self-Assessment Report
- Audit discussions

Preliminary assessment and analysis of the peers:
During the on-site-visit the panel discussed with the programme co-ordinators the aspect of a Diploma Supplements that was not presented with the self-assessment report. Thus, a version in Bosnian language could be produced but it was explained that due to legal restrictions no official English translations were handed out to the graduates. The panel checked the Bosnian version and understood that all required information about the programme contents, the curricula, the calculation of the final grade and the Bosnian system of higher education are given. However, they emphasized that according to the Bologna statutes an English version of the Diploma Supplement must be handed out to any graduates. Further, they realized that an exemplary English version of the Diploma Supplement is presented on the website. Following this example, translations should be provided automatically.

Criterion 5.3 Relevant rules

Evidence:

- Website for ECTS Documents (accessed 09 April 2018): http://www.etf.unsa.ba/index.php?id=385
- Legal Texts of the University of Sarajevo (accessed 09 April 2018): http://www.unsa.ba/index.php/en/o-univerzitetu/propisi
- Self-Assessment Report

- Audit discussions

Preliminary assessment and analysis of the peers:
The peers realized that regulations for all important aspects of student life and the respective degree programmes have been issued by the HEI and are accessible to the students through the University website. During the discussion with the students, it became clear that all participants knew perfectly well where to find any regulations or whom to contact if any additional information was required.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:

The peers emphasize the importance of an English version of the Diploma Supplement and the revision of some of the module descriptions. Hence, they consider the criterion to be partly fulfilled.

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-Assessment Report
- Audit discussions

Preliminary assessment and analysis of the peers:
The aspect of Quality Assurance was thoroughly discussed with all stakeholders during the on-site-visit and the peers learned that there is a course evaluation system in place requiring that evaluations of each course are carried out twice a year. The questionnaires are answered online and results are passed on to the Dean who initiates measures in case of any problems. As supervising instruments there is a quality assurance board on university as well as faculty level including representatives of all stakeholder groups. However, the peers were informed that the university is undergoing some reforms due to legal changes and that elements of quality management are constantly centralized. In order to improve the communication with the students about student issues the faculty plans to introduce a panel with student representatives of each year that will be discussing the evaluation results. This seems to be an important step since all stakeholders agree that the response

rate from students to the evaluation is very low and should be increased. Students expressed doubts whether the surveys have any effect even if something is criticized and some were afraid that the surveys were not totally anonymous. Also, the willingness of the teaching staff to change anything because of survey results was expected to be minimal. This was an impression which was partly confirmed during the discussion with the staff members as several declared that they did not consider student surveys to be helpful or objective and that, thus, they were not very eager to discuss survey results with their students. All agrees that the timing of the evaluation was part of the reason why the response rate is so low since the website is open only for quite a short period in the middle of the examination period when students focus on other things. Consequently, the peers deem it necessary to increase student participation in the survey, for example through extending the survey period. In any case, the strict application of quality assessment and evaluations by the teaching staff should be ensured. Further, the peers support the programme coordinators in their objective to increase the co-operation with and the survey of the programmes' alumni that will be a helpful source in developing the programmes and also to increase the programmes' association with work practice.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 6:

The peers underline the importance of student participation in the course evaluation system that needs to be continually improved. Consequently, they consider the criterion to be partly fulfilled.

D Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

No additional documents needed

E Comment of the Higher Education Institution (18.05.2018)

The following quotes the comment of the institution:

„We appreciate the observations and comments made by the ASIIN peers. We are pleased that the ASIIN peers realized that significant modifications have been undertaken since the previous accreditation, especially in the IC programme; and with recognition that all programmes adequately reflect the ASIIN Subject-Specific Criteria as well as the EQF-level 6 for Bachelor programmes. We agree with the comments in the report and will take respective actions. In accordance with the comments expressed in the report, Faculty of Electrical Engineering has already started with revision of the Master study programmes as preparation for the accreditation.“

F Summary: Peer recommendations

Taking into account the additional information and the comments the peers summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Automatic Control and Electronics	With requirements for one year	EUR-ACE	30.09.2024
Ba Computing and Informatics	With requirements for one year	Euro-Inf	30.09.2024
Ba Power Engineering	With requirements for one year	EUR-ACE	30.09.2024
Ba Telecommunications	With requirements for one year	Euro-Inf	30.09.2024

Requirements

A 1. (ASIIN 6) Ensure a strict application of course evaluation surveys. Student participation should be further enhanced.

A 2. (ASIIN 5.2) An English version of the Diploma Supplement must be handed out to all graduates.

Recommendations for all programmes

E 1. (ASIIN 2.1) It is strongly recommended to guarantee an appropriate academic level of all Bachelor theses.

E 2. (ASIIN 1.3) It is recommended to create a mandatory module in form of a seminar in preparation of the bachelor thesis.

E 3. (ASIIN 3) It is recommended to tailor examination methods according to the conveyed competences and learning outcomes.

E 4. (ASIIN 2.1) It is recommended to provide support for short internships and work experience especially in Power Engineering and Telecommunications.

E 5. (ASIIN 4.1) It is recommended to reduce the differences in the ratio of teaching staff and number of students between the four programmes.

E 6. (ASIIN 2.4) It is recommended to improve the online access to information about the degree programmes for all stakeholders.

E 7. (ASIIN 5.1) It is recommended to revise the module descriptions in discrete mathematics and mathematical logic and probability theory in order to avoid the impression of significant overlaps.

E 8. (ASIIN 4.1) It is recommended to increase the number of (student) lab assistants in order to reduce the workload for teaching assistants.

E 9. (ASIIN 2.4) It is recommended to create more room for individual and student group work.

E 10. (ASIIN 1.3) It is recommended to offer subject-related courses of non-technical skills in co-operation with other faculties.

Recommendations for the Ba Automatic Control and Electronics and Ba Telecommunications

E 11. (ASIIN 1.3) It is recommended to strengthen aspects of High Frequency Electromagnetic Interference in Automatic Control and Telecommunications.

G Comment of the Technical Committees

Technical Committee 04 – Informatics (15.06.2018)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and especially Recommendation 1. A few members argue that the issue is so pressing that it should be made a requirement to be fulfilled immediately by the University. Eventually, a majority agrees that a long-term improvement as a consequence of the recommendation would be more recommendable.

Assessment and analysis for the award of the Euro-Inf® Labels:

The TC agrees with the assessment of the peers that the learning outcomes of the programmes Ba Computing and Informatics and Ba Telecommunication correspond with the Subject-Specific Criteria of the Techical Committee 04 – Informatics.

The Technical Committee 04 – Informatcs recommends to award the labels as follows:

Degree Programme	**ASIIN-seal**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Automatic Control and Electronics	With requirements for one year	EUR-ACE	30.09.2024
Ba Computing and Informatics	With requirements for one year	Euro-Inf	30.09.2024
Ba Power Engineering	With requirements for one year	EUR-ACE	30.09.2024
Ba Telecommunications	With requirements for one year	Euro-Inf	30.09.2024

Technical Committee 02 – ET/IT (15.06.2018)

Analyse und Bewertung zur Vergabe des Fach-Siegels der ASIIN:
It fully agrees with the peers' assessment of the quality of the Bachelor theses. Although the Technical Committee considers the integration of some kind of preparatory work to the

Bachelor Thesis as a means to ensure an adequate quality level of the final work (recommendation 2 and recommendation 1), it also confirms a separate recommendation to this end (recommendation 1). However, a minor editorial modification to better bring to the fore the meaning of the recommendation is proposed. Concerning recommendation 4, it should be made clear that the disciplinary reference is linked to the respective degree programmes, while this reference is already transparent in recommendation 10.

The Technical Committee finally discusses, whether recommendation 5 (ratio between students and teachers) is helpful. According to the report, it considers the ratio, although at times remark-ably different, generally acceptable and within reasonable range. Making the point in the report would therefore be sufficient in the view of the Technical Committee.

Lastly, the Technical Committee proposes a minor editorial change of words in the recommendation 8.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee judges that the intended learning outcomes of the degree programmes do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 02.

The Technical and Information Technology recommends the award of the seals as follows:

Degree Programme	**ASIIN-seal**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Automatic Control and Electronics	With requirements for one year	EUR-ACE	30.09.2024
Ba Computing and Informatics	With requirements for one year	Euro-Inf	30.09.2024
Ba Power Engineering	With requirements for one year	EUR-ACE	30.09.2024
Ba Telecommunications	With requirements for one year	Euro-Inf	30.09.2024

Requirements

A 1. (ASIIN 6) Ensure a strict application of course evaluation surveys. Student participation should be further enhanced.

A 2. (ASIIN 5.2) An English version of the Diploma Supplement must be handed out to all graduates.

Recommendations for all programmes

E 1. (ASIIN 2.1) It is strongly recommended ~~to guarantee~~ to ensure (Vorschlag FA 02) an appropriate academic level of all Bachelor theses.

E 2. (ASIIN 1.3) It is recommended to create a mandatory module in form of a seminar in preparation of the bachelor thesis.

E 3. (ASIIN 3) It is recommended to tailor examination methods according to the conveyed competences and learning outcomes.

E 4. (ASIIN 2.1) It is recommended to provide support for short internships and work experience especially in the degree programmes (Vorschlag FA 02) Power Engineering and Telecommunications.

~~E 5. (ASIIN 4.1) It is recommended to reduce the differences in the ratio of teaching staff and number of students between the four programmes.~~ Vorschlag FA 02

E 6. (ASIIN 2.4) It is recommended to improve the online access to information about the degree programmes for all stakeholders.

E 7. (ASIIN 5.1) It is recommended to revise the module descriptions in discrete mathematics and mathematical logic and probability theory in order to avoid the impression of significant overlaps.

E 8. (ASIIN 4.1) It is recommended to increase the number of (student) lab assistants in order to reduce the workload for teaching assistants.

E 9. (ASIIN 2.4) It is recommended to~~ create more room~~ provide more space (Vorschlag FA 02) for individual and student group work.

E 10. (ASIIN 1.3) It is recommended to offer subject-related courses of non-technical skills in co-operation with other faculties.

Recommendations for the Ba Automatic Control and Electronics and Ba Telecommunications

E 11. (ASIIN 1.3) It is recommended to strengthen aspects of High Frequency Electromagnetic Interference ~~in Automatic Control and Telecommunications.~~ (Vorschlag FA 02)

H Decision of the Accreditation Commission (29.06.2018)

Assessment and analysis for *the award of the subject-specific ASIIN seal:*
The Accreditation Committee discusses the procedure and generally agrees with the assessment of peers and Technical Committees. Some modification in the wording are agreed on in order to emphasize especially the importance of improving the scientific level of the Bachelor theses. Concerning the recommendation 5 the Commission comes to the conclusion that the aspect is not as important since the success of the degree programmes is not in danger. Thus, the expressed recommendation is not necessary. Similarly, recommendation 11 is deleted since the relevance of High Frequency Electromagnetic Interference is sufficiently described in the report.

Assessment and analysis for the award of the EUR-ACE® Label:

The AC judges that the intended learning outcomes of the degree programmes do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 02.

Assessment and analysis for the award of the Euro-Inf® Labels:

The AC agrees with the assessment of the peers that the learning outcomes of the programmes Ba Computing and Informatics and Ba Telecommunication correspond with the Subject-Specific Criteria of the Technical Committee 04 – Informatics.

The Accreditation Commission for Degree Programmes decides to award the following seals:

Degree Programme	**ASIIN-seal**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Automatic Control and Electronics	With requirements for one year	EUR-ACE	30.09.2024
Ba Computing and Informatics	With requirements for one year	Euro-Inf	30.09.2024
Ba Power Engineering	With requirements for one year	EUR-ACE	30.09.2024

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Telecommunications	With requirements for one year	Euro-Inf	30.09.2024

Requirements

A 1. (ASIIN 6) Ensure a strict application of course evaluation surveys.

A 2. (ASIIN 5.2) An English version of the Diploma Supplement must be handed out to all graduates.

Recommendations for all programmes

E 1. (ASIIN 2.1) It is essential to ensure an appropriate academic level of all Bachelor theses.

E 2. (ASIIN 1.3) It is recommended to create a mandatory module in form of a seminar in preparation of the bachelor thesis.

E 3. (ASIIN 3) It is recommended to tailor examination methods according to the conveyed competences and learning outcomes.

E 4. (ASIIN 2.1) It is recommended to provide support for short internships and work experience especially in the degree programmes Power Engineering and Telecommunications.

E 5. (ASIIN 2.4) It is recommended to improve the online access to information about the degree programmes for all stakeholders.

E 6. (ASIIN 5.1) It is recommended to revise the module descriptions in discrete mathematics and mathematical logic and probability theory in order to avoid the impression of significant overlaps.

E 7. (ASIIN 4.1) It is recommended to increase the number of (student) lab assistants in order to reduce the workload for teaching assistants.

E 8. (ASIIN 2.4) It is recommended to provide more learning space for individual and student group work.

E 9. (ASIIN 1.3) It is recommended to offer subject-related courses of non-technical skills in co-operation with other faculties.

I Fulfilment of Requirements (28.06.2019)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Automatic Control and Electronics	All requirements fulfilled	EUR-ACE®	30.09.2024
Ba Computing and Informatics	All requirements fulfilled	Euro-Inf®	30.09.2024
Ba Power Engineering	All requirements fulfilled	EUR-ACE®	30.09.2024
Ba Telecommunications	All requirements fulfilled	Euro-Inf®	30.09.2024

Appendix: Programme Learning Outcomes and Curricula

According to website the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Automatic Control and Electronics (access 3rd April 2018: http://www.etf.unsa.ba/index.php?id=375):

Educational Objectives of the programme

Having fundamental knowledge required for electrical engineers in the area of automatic control and electronics, educated in the: electrical engineering, measurement, electronics, physics, mathematics, modelling, signal and system theory, control theory and programming.

Having broad education in the area of control and electronics

Having following knowledge required to work as control and electronics engineer:

Maintenance and adjustments of the control systems,

Programming software for the control systems,

Design and build components and subsystems for the control systems,

Design and implement electronic devices based on analogue, digital and microcomputer technology.

Having knowledge, skills and competences enabling him for further education and lifelong learning;

Capable to follow up and use relevant literature

Capable for continual adoption of new knowledge through informal learning methods and practical work,

Having communication skills, being prepared for a team work with professionals from the same or other fields, being engineer responsible towards his profession and society at large.

Learning Outcomes

The first cycle graduate student has the following knowledge, skills and competences:

Basic knowledge and understanding mathematics, physics, electrical engineering, computing and programming.

Basic engineering knowledge of analysis, synthesis, defining and solving practical problems.

Awareness of the correlation between control and electronics on one side and electrical engineering, mathematics, physics, and other engineering disciplines on other.

Firm knowledge in the area of automatic control and electronics: analogue, digital and integrated electronics, linear and digital control theory, signal processing, dynamic system modelling and simulation, measurement in electrical engineering and measurement of non-electrical quantity, logic design, power system control, mechatronics.

Making decisions and implementing appropriate engineering, mathematical and computing methods for the problems in the area of control and electronics.

Identify, analyse and define problems in the area of control and electronics, without being exposed to them during study.

Solving given problems using acquire engineering knowledge, general knowledge in mathematics, physics and computer science, as well as specialist knowledge in field of automatic control and electronics, using adequate literature and documentation search.

Design and conduct experiments, drawing conclusions and testing hypothesis, in the area of control and electronics, Analysis, synthesis and design: electronic circuitry, digital systems, control systems components and subsystems, mechatronic systems, software applications for control systems, using appropriate methods and techniques and taking into account scientific technical, social, environmental and economic conditions and standards.

Application of control and electronics in practical working environment, knowledge of standards and understanding the influence that automatic control systems have on their environment.

Ability to work in different professional areas due to achieved general, specialist and methodology competences.

Consulting relevant literature, attending courses, adopting new knowledge and technology.

Communicating with colleagues and public about issues related to all areas of the control systems and electronics.

Individual and team work.

To answer to industry requests during his professional engagement.

The following **curriculum** is presented:

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 1	ETF IM1 I-1175	**7**	49	0	26	87
2	Fundaments of Electrical Engineering	ETF OE I-1180	**7**	48	4	28	107
3	Physics for Engineers 1	ETF IF1 I-1160	**5**	39	0	21	65
4	Linear Algebra and Geometry	ETF LAG I-1160	**5**	39	0	21	65
5	Fundamentals of Computing	ETF OR I-1170	**6**	44	26	0	80
	TOTAL:		**30**	**219**	**30**	**96**	**404**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 2	ETF IM2 I-1280	**7**	52	0	28	107
2	Electrical Circuits 1	ETF EK1 I-1275	**7**	45	10	20	87
3	Physics for Engineers 2	ETF IF2 I-1260	**5**	39	0	21	65
4	Programming Techniques	ETF TP I-1270	**6**	44	26	0	80
5	Electronic Elements and Circuits	ETF EES I-1260	**5**	39	0	21	65
	TOTAL:		**30**	**219**	**36**	**90**	**404**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 3	ETF AEO IM3 I-2380	**5**	50	0	30	60
2	Electrical Circuits 2	ETF AEO EK2 I-2365	**6**	42	0	23	85
3	Electrical Measurements	ETF AEO EM I-2360	**5**	35	20	5	60
4	Analogue Electronics	ETF AEO AE I-2360	**5**	36	24	0	65
5	Sensors and Measurements	ETF AEO SM I-2360	**5**	36	18	6	65
6	Elective module 3.1		**4**	35	0	10	45
	TOTAL:		**30**	**234**	**62**	**74**	**380**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Digital Electronics	ETF AEO DE I-2460	**5**	39	16	10	65
2	Modelling and Simulations	ETF AEO MS I-2460	**5**	39	21	0	65
3	Linear Control Systems	ETF AEO LS I-2460	**5**	36	8	16	65
4	Elective module 4.1		**5**	11	39	0	65
5	Elective Module 4.2		**5**	39	22	5	65
6	Elective Module 4.3		**5**	42	7	14	65
	TOTAL:		**30**	**206**	**113**	**45**	**390**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Digital Integrated Circuits	ETF AEO DIK I-3560	**5**	36	24	0	65
2	Digital Control Systems	ETF AEO DSU I3560	**5**	36	8	16	65
3	Signals and Systems	ETF AEO SS I-3560	**5**	36	8	16	65
4	Design of Logical Systems	ETF AEO PLS I-3560	**5**	42	18	0	65
5	Elective Module 5.1		5	15	36	9	65
6	Elective Module 5.2		**5**	39	21	0	65
	TOTAL:		**30**	**204**	**115**	**41**	**390**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Structures and Regimes of Operation of Electric Power Systems	ETF AEO SES I3660	**5**	33	18	9	65
2	Mechatronics	ETF AEO ME I-3660	**5**	42	18	0	65
3	Elective Module 6.1		**4**	39	11	13	50
4	Elective Module 6.2		**4**	36	11	10	50

5	Final Thesis	ETF AEO ZR I-36110	**12**	110			300
	TOTAL:		**30**	**260**	**58**	**32**	**530**

According to website the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Power Electrical Engineering (access 3rd April 2018: http://www.etf.unsa.ba/index.php?id=376):

Educational Objectives of the programme

Prepared for challenging, successful and productive career with emphasis on technical competency and with attention to teamwork and effective communication with people of diverse technical backgrounds.

Capable to participate and conduct analysis of concrete problems and make technically correct decisions and solutions.

Prepared for the successful pursuit of Bachelor studies and for life-long learning in power electrical engineering and related fields.

Endowed with sense of professionalism and ethical responsibility

Having knowledge and understanding of principles of electrical engineering, natural sciences, mathematics and computer programming

Having knowledge of the main principles of designing, modeling and solving concrete problems in the field of power electrical engineering.

Endowed with a sense of environment awareness and encouraged to support energy efficiency and usage of renewable energy sources.

Prepared and qualified for further study in Master program.

Learning Outcomes

The ability to apply knowledge of the physical sciences, mathematics, and engineering fundamentals to the solution of medium complexity problems appearing in power electrical engineering sector;

Design and conduct medium complexity experiments in power electrical engineering and analyze and interpret results generated by those experiments;

Design components, devices and systems – especially electrical installations in power electrical and mechanical engineering

The ability to participate effectively in multi-disciplinary teams involving people with diverse technical backgrounds

Identify and formulate problems in power electrical engineering and evaluate and generating solutions to problems of medium complexity

Recognize the need for, and ability for long life learning for a successful engineering career

Understand their professional and ethical responsibility and apply that knowledge in practice

The ability to communicate effectively

The ability to understand the impact and importance of power electrical engineering in societal context

Application of techniques, tools, skills of modern engineering, including computer based technologies, to solving medium complexity problems in power engineering

Prepared and qualified for further study in Master program.

The following **curriculum** is presented:

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 1	ETF IM1 I-1175	**7**	49	0	26	87
2	Fundaments of Electrical Engineering	ETF OE I-1180	**7**	48	4	28	107
3	Physics for Engineers 1	ETF IF1 I-1160	**5**	39	0	21	65
4	Linear Algebra and Geometry	ETF LAG I-1160	**5**	39	0	21	65
5	Fundamentals of Computing	ETF OR I-1170	**6**	44	26	0	80
	TOTAL:		**30**	**219**	**30**	**96**	**404**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 2	ETF IM2 I-1280	**7**	52	0	28	107
2	Electrical Circuits 1	ETF EK1 I-1275	**7**	45	10	20	87
3	Physics for Engineers 2	ETF IF2 I-1260	**5**	39	0	21	65

4	Programming Techniques	ETF TP I-1270	**6**	44	26	0	80
5	Electronic Elements and Circuits	ETF EES I-1260	**5**	39	0	21	65
	TOTAL:		**30**	**219**	**36**	**90**	**404**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Engineering Electromagnetic	ETF EEO IEM 2365	**6,0**	31	16	18	85
2	Electrical Circuits 2	ETF EEO EK2 2375	**6,0**	49	6	20	75
3	Reliability of Electrical Components and Systems	ETF EEO PEES 2360	**6,0**	40	0	20	90
4	Electrical Measurements	ETF EEO EM 2360	**6,0**	38	10	12	90
5	Fundamentals of Electrical Power Systems	ETF EEO OEES 2370	**6,0**	42	14	14	80
	TOTAL:		**30,0**	**200**	**46**	**84**	**420**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Automatic Control Systems Fundamentals	ETF EEO OSAU 2460	**5,0**	36	10	14	65
2	Telecommunication Basics	ETF EEO OTK 2460	**5,0**	42	7	7	69
3	Electrical Engineering Materials	ETF EEO ETM 2460	**5,0**	40	8	12	65
4	Engineering Economic	ETF EEO IEK 2460	**5,0**	40	0	20	65
5	Elective Module 1		**5,0**				
6	Elective Module 2		**5,0**				
	TOTAL:		**30,0**				

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Electrical Machines	ETF EEO EM 3570	**5,0**	39	16	15	55
2	Basics of Power Electronic	ETF EEO EE 3560	**5,0**	39	11	10	65
3	Electrical Power Systems	ETF EEO EES 3570	**5,0**	42	18	10	55
4	High Voltage Insulation Technologies	ETF EEO TVI 3560	**5,0**	40	8	12	65

5	Lab. Work in Electrical Power Engineering 1	ETF EEO PE1 3530	**4,0**	20	10	0	70
6	Elective Module 3		**3,0**				
7	Elective Module 4		**3,0**				
	TOTAL:		**30,0**				

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Electrical Drives	ETF EEO EMP 3670	**5,0**	39	16	15	55
2	Electrical Substations	ETF EEO EP 3670	**5,0**	40	8	22	55
3	Electrical Energy Generation	ETF EEO PEE 3660	**5,0**	50	10	0	65
4	Elective Module 5		**3,0**				
5	Final Project	ETF EEO ZR 36120	**12,0**				
	TOTAL:		**30,0**				

According to website the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Computing and Informatics (access 3rd April 2018: http://www.etf.unsa.ba/index.php?id=377):

Bachelor of Electrical Engineering, Computing and Informatics is:

- having a fundamental knowledge of mathematics, physics, electrical engineering, electronics, programming, computer algorithms, computer architecture and operating systems needed to electrical engineers with a focus on applications in the field of Computing and Informatics

- having a broad education in the field of computer science and software engineering with an insight into current issues in the above areas, which enables him to identify and solve engineering problems of Computing and Informatics

- Possess the skills necessary to work as an engineer in the area of Computing and Informatics to analyze, design, implement and maintain hardware and software of computer systems for various purposes

- Having knowledge, skills and competences to continue education and for a lifelong learning Having appropriate communication skills, ready for team work with professionals from

the same or other fields, being engin-eer responsible towards his profession and society at large.

The first cycle graduate student has the following knowledge, skills and competences:

Basic knowledge in mathematics, physics and electrical engineering, as well as a deeper knowledge and understanding in the field of computer science

Ability to analyze, identify and define the requirements for the problems in the field of computer science and software engineering

The ability to design, implement and evaluate computer-based processes and components, including programming necessary solutions

Insight into the connection between computer science and electrical engineering with other engineering disciplines, as well as mathematics and physics

Good knowledge of the following areas of computer science and software engineering: discrete structures, programming and programming languages computer algorithms and data structures, software engineering, computer architecture and computer networks, operating systems, computer graphics, intelligent systems, information systems

The ability to select and apply appropriate engineering principles and mathematical and computational methods to problems in the field of Computing and Informatics

The ability to identify, analyze and present problems in the field of computer science and software engineering without being exposed to them during study.

The ability of solving given problems using acquire engineering knowledge, general knowledge in mathematics, physics and computer science, as well as specialist knowledge in field of computer science and informatics, using adequate literature and documentation search.

Design and conduct experiments, drawing conclusions and testing hypothesis, in the area of computer science and software engineering,

Ability to analyze, design and implement computer system components (programs, databases, hardware subsystems, etc.) using appropriate methods and techniques taking into account the scientific, technical, social, environmental and economic conditions and standards

Knowledge of standards and understanding the influence that computer systems, their operation and maintenance, have on their environment.

Understanding the needs and achievement to follow up the development of computer systems and to learn new principles, techniques and technologies in all above mentioned areas

Ability to work in various professional fields due to achieved general, specialist and methodology competences.

Communicating with colleagues and public about issues related to all areas of the Computing and Informatics.

Individual and team work, starting and implementing projects

To answer to industry and academia requests during professional engagement.

The following **curriculum** is presented:

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 1	ETF IM1 I-1175	**7**	49	0	26	87
2	Fundaments of Electrical Engineering	ETF OE I-1180	**7**	48	4	28	107
3	Physics for Engineers 1	ETF IF1 I-1160	**5**	39	0	21	65
4	Linear Algebra and Geometry	ETF LAG I-1160	**5**	39	0	21	65
5	Fundamentals of Computing	ETF OR I-1170	**6**	44	26	0	80
	TOTAL:		**30**	**219**	**30**	**96**	**404**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 2	ETF IM2 I-1280	**7**	52	0	28	107
2	Programming Techniques	ETF TP I-1270	**6**	44	26	0	80
3	Elective course		**7**				
4	Elective course		**5**				
5	Elective course		**5**				
	TOTAL:		**30**				

No	Module	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester

1	Algorithms and Data Structures	**5**	38	22	0	**65**
2	Logic Design	**5**	38	10	12	**65**
3	Software Development	**5**	38	22	0	**65**
4	Fundamentals of Database Systems	**5**	38	22	0	**65**
5	Discrete Mathematics	**5**	39	0	21	**65**
6	Elective module 1	**5**				**75**
	TOTAL:	**30**				**400**

No	Module	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Computer Architectures	**5**	40	20	0	**65**
2	Fundamentals of Computer Networks	**5**	40	14	6	**65**
3	Object Oriented Analysis and Design	**5**	38	22	0	**65**
4	Automata and Formal Languages	**5**	38	0	22	**65**
5	Elective module 2	**5**				**75**
6	Elective module 3	**5**				**75**
	TOTAL:	**30**				**410**

No	Module	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Web Technologies	**5**	40	20	0	**65**
2	Computer Graphics	**5**	22	30	8	**65**
3	Fundamentals of Information Systems	**5**	30	20	10	**65**
4	Introduction to Operations Research	**5**	40	14	6	**65**
5	Elective module 4	**5**				**75**
6	Elective module 5	**5**				**75**
	TOTAL:	**30**				**390**

No	Module	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Software Engineering	**5**	35	25	0	**65**

2	Design of Information Systems	**4**	38	11	11	**40**
3	Artificial Intelligence	**5**	35	25	0	**65**
4	Elective module 6	**4**	50			**50**
5	***Bachelor's Thesis***	**12**				**300**
	TOTAL:	**30**				**520**

According to website the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Telecommunications (access 3rd April 2018: http://www.etf.unsa.ba/index.php?id=378):

"Possesses fundamental knowledge in mathematics, physics, electrical engineering, electronics, electromagnetics and information theory necessary for an electrical engineer with focus on telecommunications;

Has broad education in the field of electrical engineering and telecommunications with an overview of current telecommunications issues which enables him to identify and solve engineering problems in the area of telecommunications and contribute to design of telecommunication systems and processes;

Has the following skills required to work as telecommunications engineer:

- Design, planning, operating and maintenance of: communications systems and software applications required for their work; electronic systems related to telecommunication systems; communication networks, telemetric and similar applications; signal processing systems;
- Design of components and subsystems of telecommunication systems;

Possesses knowledge, skills and competences that enable continuation of education in the area of telecommunications or similar area;

Is enabled to follow and use professional literature and continuously acquire new knowledge through informal learning methods and apply them in practice, and is aware of necessity of further professional improvement through a process of lifelong learning;

Possesses adequate communication skills and is ready for team work with people from the same or different areas, and is responsible towards profession and society in general;

Learning Outcomes

Fundamental knowledge of mathematics and physics as well as deepened knowledge and understanding of electrical engineering;

Fundamental engineering knowledge in problem statement, analysis and solution;

Insight into connection of telecommunications with electrical engineering and other engineering discipline, as well as with mathematics, physics and computer engineering and information technologies;

Computer science and programming knowledge needed for application of computer based methods; Good specialist knowledge of the following telecommunication areas: Electronics, Electromagnetic fields and wave propagation, Information theory and theory of signals and systems in telecommunications, Telecommunications techniques, Telecommunications network nods, Wireless Telecommunications, Networking, network protocols and traffic theory;

Competency to select and apply appropriate engineering principles and mathematic and computing methods to telecommunication problems;

Competency to identify, analyze and state telecommunication problems they have not seen during studies;

Competency to solve mentioned problems applying acquired engineering knowledge, general mathematics, physics and computer science knowledge, and specialist telecommunication knowledge and using appropriate literature they are trained to find;

Competence to plan and execute tests and experiments in the area of telecommunications that can provide conclusions and check hypothesis;

Competence to analyze, synthesize and configure: communication systems, electronic systems related to telecommunications systems, communication networks, telemetric and similar applications, communications systems and software applications required for their work, using appropriate methods and techniques considering scientific, technical, social, environmental and environmental conditions and standards;

Knowledge of practical usage of telecommunications, knowledge of standards and understanding of influence telecommunication systems, their operation and maintenance have on environment and understanding need for sustainable development;

Awareness of need and realization of continuous following of telecommunications development and learning of new principles, techniques and technologies in all above mentioned areas of telecommunications;

Capability to work in various professional areas owing to acquired general, specialist and methodological competencies, capability to communicate with colleagues and public about questions and issues related to all areas of telecommunications, capability to work individually or as a part of team, to organize and implement projects;

Readiness to professional and academic requirements when employed after graduation.

The following **curriculum** is presented:

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 1	ETF IM1 I-1175	**7**	49	0	26	87
2	Fundaments of Electrical Engineering	ETF OE I-1180	**7**	48	4	28	107
3	Physics for Engineers 1	ETF IF1 I-1160	**5**	39	0	21	65
4	Linear Algebra and Geometry	ETF LAG I-1160	**5**	39	0	21	65
5	Fundamentals of Computing	ETF OR I-1170	**6**	44	26	0	80
	TOTAL:		**30**	**219**	**30**	**96**	**404**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Mathematics for Engineers 2	ETF IM2 I-1280	**7**	52	0	28	107
2	Electrical Circuits 1	ETF EK1 I-1275	**7**	45	10	20	87
3	Physics for Engineers 2	ETF IF2 I-1260	**5**	39	0	21	65
4	Programming Techniques	ETF TP I-1270	**6**	44	26	0	80
5	Electronic Elements and Circuits	ETF EES I-1260	**5**	39	0	21	65
	TOTAL:		**30**	**219**	**36**	**90**	**404**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Electromagnetic Field Theory	ETF TKO TEP I-2365	**6,0**	42	0	23	85
2	Electrical Circuits 2	ETF TKO EK2 I-2365	**6,0**	49	6	20	75
3	Electronics TK1	ETF TKO E1 I-2350	**4,0**	30	20	0	50
4	Information Theory and Source Coding	ETF TKO TIIK I-2355	**5,0**	35	6	14	70
5	Signal Theory	ETF TKO TS I-2365	**6,0**	42	9	14	85
6	Elective Course 3.1		**3,0**	35	0	15	25

	TOTAL:		**30**	**233**	**41**	**86**	**390**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Statistical Signal Theory	ETF TKO STS I-2470	**6,0**	42	7	21	80
2	Electronics TK2	ETF TKO E2 I-2450	**5,0**	30	20	0	75
3	Fundamentals of Optoelectronics	ETF TKO OO I-2450	**5,0**	36	7	7	75
4	Antennas and Wave Propagation	ETF TKO APT I-2460	**5,0**	42	11	7	65
5	Telecommunication Techniques 1	ETF TKO TT1 I-2480	**6,0**	52	14	14	70
6	Elective Course 4.1		**3,0**	26	14	10	25
	TOTAL:		**30**	**228**	**73**	**59**	**390**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Telecommunication Techniques 2	ETF TKO TT2 I-3570	**6,0**	48	14	8	80
2	RF Circuit Design	ETF TKO R I-3550	**4,0**	30	12	8	50
3	Mobile Communication	ETF TKO MK I-3560	**5,0**	36	12	12	65
4	Channel Coding	ETF TKO KK I-3560	**5,0**	39	14	7	65
5	Elective Course 5.1		**5,0**	35	10	10	70
6	Elective Course 5.2		**5,0**	35	10	10	70
	TOTAL:		**30**	**223**	**72**	**55**	**400**

No	Module	Code	ECTS points	Lectures hours/ semester	Lab. hours/ semester	Tutorials hours/ semester	Personal study hours/ semester
1	Microwave Communication Systems	ETF TKO MKS I-3650	**4,0**	29	14	7	50
2	Switching Systems	ETF TKO KS I-3660	**5,0**	40	7	13	65
3	Communication Protocols and Networks	ETF TKO KPM I-3660	**5,0**	40	13	7	65
4	Elective Course 6.1		**4,0**	30	10	10	50
5	Final Thesis	ETF TKO ZR I-36120	**12,0**	0	0	0	300
	TOTAL:		**30**	**139**	**44**	**37**	**530**