1st Workshop on Qualification and Occupational Standards

18-19 December 2013, Sarajevo

Working group tasks after the first common workshop	
1. Decide the chairperson of the group for the work until the next common workshop, the date and the place of the group internal meeting	
Group	ICT In compliance with ACM/AIS/IEEE-CS 2005 classification, ICT includes: Computer Engineering Computer Science Information Systems Information Technology Software Engineering
Chairperson	Associate Professor, Samra Mujačić, D.Sc.
Members	Assistant Professor Đorđe Babić, D.Sc. Drago Vidović, Grad. Eng. Assistant Professor Nina Bijedić, D.Sc. Assistant Professor Jasmin Azemović, D.Sc. Professor Milomir Šoja, D.Sc. Assistant Professor Danijel Mijić, D.Sc. Assistant Professor Jasminka Hasić, Ph.D. Professor Milenko Obad, D.Sc. Krešimir Rakić, M.Sc. Assistant Professor Samir Lemeš, D.Sc. Associate Professor Senad Balić, D.Sc. Eldin Okanović, Grad. Eng. Amel Džanić, Grad. Eng. Assistant Professor Brđanin Dražen, D.Sc. Assistant Professor Matić Dragan, D.Sc. Associate Professor Suad Kasapović, D.Sc. Associate Professor Samra Mujačić, D.Sc. Professor Samim Konjicija, D.Sc. Amir Hajdar, M.Sc.
Date	February 6th, 2014
Place	Sarajevo
2. Find study programmes at your universities for agreed profile and level of qualification	
Titles of programmes and universities	1. University Slobomir P Faculty of Information Technology 1.1. Information Technology (180 ECTS) 1.2. Information Technology (240 ECTS)
	2. University "Džemal Bijedić" Mostar Faculty of Information Technology 2.1. Information Technology (180 ECTS) Faculty of Mechanical Engineering

	2.2. Computer Engineering (180 ECTS)
	3. University of East Sarajevo Faculty of Electrical Engineering 3.1. Computer and Information Science (240 ECTS)
	4. International University of Sarajevo Faculty of Natural and Technical Sciences 4.1. Computer Science and Engineering (240 ECTS)
	5. University of Mostar Faculty of Mechanical Engineering and Computer Science 5.1. Computer Science (180 ECTS)
	6. University of Zenica Faculty of Philosophy 6.1. Mathematics and Information Science (240 ECTS)
	7. University of Bihać Faculty of Education Sciences 7.1. Mathematics and Information Science (?)
	8. University of Banja Luka Faculty of Electrical Engineering 8.1. Computer and Information Science (240 ECTS) Faculty of Natural Sciences 8.2. Mathematics and Information Science (240 ECTS)
	9. University of Tuzla Faculty of Electrical Engineering 9.1. Electrical Engineering and Computer Science (240 ECTS) Faculty of Philosophy 9.2. Technical Education and Information Science (180 ECTS)
	10. University of Sarajevo Faculty of Electrical Engineering 10.1. Computer and Information Science (180 ECTS) Faculty of Economics 10.2. Information Systems (180 ECTS) Faculty of Natural Sciences 10.3. Theoretical Computer Science (180 ECTS)

3. Analyse written statements of intended learning outcomes in programmes

(3-A) Intended learning outcomes **<u>are well written</u>** in the following programmes	8.1.
(3-B) Intended learning outcomes **<u>are partially written</u>** in the following programmes	6.1.
(3-C) Intended learning outcomes **<u>are not written</u>** in the following programmes	
In the case of 3-A, choose one of such programmes and write intended competences at the	Programme: 8.1. Computer and Information Science (Faculty of Electrical Engineering, University of Banja Luka)

level of programme	A) Knowledge and understanding 1. General knowledge: • general knowledge of mathematics, physics and electrical engineering, • knowledge of principles and details of organisation and functioning of computers and computer-based systems, • understanding fundamental data structures and algorithms, knowledge of the manner of their practical implementation and possibilities of application for resolving application problems, • theoretical and practical knowledge of computer science needed for starting work in positions related to development, administration and maintenance of computer-based systems, • a systematic and disciplined approach to problem solution, • design and development of solutions in a single or several application domains by means of computer and software engineering techniques and disciplines, considering not only technical, but also ethical, social, legal and economic norms and aspects, • recognising the importance of achieving defined goals and deadlines for the completion of planned activities, communication and teamwork, • identification and harmonisation of conflictual project goals and situations and finding acceptable compromises in compliance with available resources and frames (costs, time, human resources, etc.). 2. Specialist knowledge and skills: Major in Software Engineering: • theoretical and practical knowledge of structural and objectively-oriented software programming and development (programming languages S, S++ and Java), • fundamental and detailed knowledge of a systematic approach and application of adequate techniques in all phases of software life cycle (planning, software request engineering, designing, coding, testing and exploitation), needed for development and implementation of a high-quality software product of the utmost complexity in different domains, • use of modern software environments and software designing, coding, testing, integration, reuse and maintenance tools, • design of data bases and implementation of data bases and IS-based systems by means of open and commercial systems for data base management,

	• design, implementation and administration of computer networks and network services, • internet technologies and programming, • development of web and service applications and network and distributed applications and systems, • knowledge of potential threats and attacks against computer-based systems, • design and implementation of data and computer-based system safety mechanisms, • performance of complex programming tasks and leading of programming teams, as well as • installation, configuration and maintenance of operating systems and monitoring of their performances. Major in Computer Engineering: • theoretical and practical knowledge of structural and objectively-oriented software programming and development (programming languages S, S++ and Java), • basic knowledge of a systematic approach and application of adequate techniques in all phases of software life cycle (planning, software request engineering, designing, implementation, testing, integration and exploitation), needed for development and implementation of installed computer-based devices and systems, • use of modern environments and tools for hardware-software development and integration, • programming and development of applications for real-time work and their integration in operating systems for real-time work, • theoretical knowledge needed for the analysis, design and application of modern linear circuits, • analysis of digital integrated circuits, combination networks, sequence networks, memories, arithmetic circuits, digital-to-analogue and analogue-to-digital conversion, • possession of knowledge needed for design of microprocessor systems with basic peripheries and low-level programming (assembly language), • knowledge of architecture of computer networks and protocols, • knowledge needed for design and development of simple automated devices and systems based on the use of micro controllers, • design and implementation of (hardware and software) integrated real-time computer systems and systems, • knowledge of analogue and digital filters and of procedures for their design, implementation and simulation, • theoretical and practical knowledge of digital signal processing and algorithm implementation skills by means of MATLAB and digital signal

	processors. B) Application of knowledge and understanding of a graduate engineer implies that he/she: • is able to assess the complexity of a problem in the field of computer and information science, • knows how to choose the relevant analytical and modelling methods, • is able to identify true problems in practice, where computer and information science is part of the solution, • is able to familiarise himself/herself fast with new solutions and applications, • possesses knowledge of potential fields for the application of the acquired knowledge, • is able to recognise a problem and identify possible solutions, • knows how to use the acquired knowledge in designing for the purpose of meeting the specified requirements, • is able to demonstrate his/her knowledge in the field of modelling, system architecture and use of available design tools, • knows all development and maintenance phases of complex systems, • considers the requirements and needs of users when designing, • is able to choose an adequate environment needed for problem solution, • knows how to create and test systems professionally, • is able to easily adapt to existing solutions. C) Making value judgments requires the following abilities and skills of a graduate engineer: • combining theory and practice for the purpose of solving problems, • use of all available information sources, • design and conduct of experiments, interpretation of results and drawing of conclusions, • understanding modern and relevant technological achievements and their application, • knowledge of impact of solutions in the field of study on the society and environment, • possession of professional ethics, responsibility and compliance with norms of behaviour in practice, • taking into consideration the pre-defined state of economy, regulations and practice, • understanding business policies, risks and restrictions, • ability to organise his/her own work, • problem solution in a cost-effective manner, • good assessment and analysis of costs and

	productivity, • creation of adequate solutions based on the available resources. D) Communication skills of a graduate engineer include: • good communication with colleagues and users, • ability to present ideas and propose solutions, • good teamwork, • ability to present his/her own professional activities and results in writing and verbally to specialists in the same field of study, • ability to present his/her professional activities and results in writing and verbally to an audience that has no specialist knowledge of that field, • ability to communicate with heterogeneous teams of specialists, • ability to draft project documents, • ability to use technical literature in English or another world language. E) Learning skills of a graduate engineer include: • ability of continuous independent learning in the field of study, • recognising and accepting the need for participating in life-long learning, • ability to transfer the acquired knowledge and skills.
In the case of 3-A, choose one topic from the chosen programme, and write intended learning outcomes	Subject: Data bases Learning outcomes: Upon successful completion of the course, students will be able to: • describe and explain basic terms, technologies and principles of organisation of relational databases, • model databases at the conceptual level and conduct transformation from the conceptual to the relational model, • specify the scheme of the specific relational database in the SQL programming language, • specify structures for working on data in a relational base in relational algebra, relational calculation and SQL, • work with a specific DBMS system (MySQL) and modelling tools (ERWin), • optimise the organisation of a relational database by means of the normalisation process.
In the case of 3-B, choose one of such programmes and write intended competences at the level of programme	Program: 6.1. Mathematics and Information Science By completing the study programme, students acquire the following abilities: • analysis, synthesis, deduction and foreseeing solutions of mathematical and information

	science problems at the level of primary and secondary school, • didactic and methodical, pedagogical and psychological competences needed for successful completion of all educational programmes in the field of mathematics and ICT at the level of primary and secondary school, • knowledge of differential and integral calculus of a single real variable and knowledge of differential and integral calculus of functions with multiple variables and ability to solve differential equations, • application of other types of knowledge in practice by means of software packages that may be applied in primary and secondary schools, such as Mathematica, Geogebra, etc. • website design, knowledge of programming elements, of data base design and use, etc. • development of communication skills and development of professional ethics, • his/her own further independent education (life-long learning) in the field of mathematics, information science (ICT) and education sciences. By completing the study programme, students acquire the following specific abilities: • basic knowledge and understanding of theoretical achievements in the field of mathematics and information science, • solution of specific problems in the field of mathematics and/or information science, • integrating basic knowledge in different fields and its application in the work with primary and secondary school students, • monitoring and application of innovations in the field of study, such as new software packages that may be applied in teaching, new learning methods, forms of work, etc.
In the case of 3-B, choose one topic from the chosen programme, and write intended learning outcomes	Subject: Computer graphics Competences (learning outcomes): Upon successful completion of the course, students will be able to: • know and understand possibilities and limitations of computer graphics, • independently use raster-to-vector software, • apply acquired knowledge and skills for creation of mathematical illustrations.
4. Analyse assessment criteria and procedures of achieved knowledge, skills and competence as written in programmes	
(4-A) Assessment criteria and procedures **<u>are well written</u>** in the following programmes	10.1.

(4-B) Assessment criteria and procedures **<u>are partially written</u>** in the following programmes	6.1.
(4-C) Assessment criteria and procedures **<u>are not written</u>** in the following programmes	
In the case of 4-A, choose one topic from the chosen programme, and write assessment criteria and procedures	Subject: Installation systems The manner of assessment of students' success achieved in relation to the subject is as follows: • Attendance of lectures and exercises (maximum 10 points). A student with more than three absences from lectures and/or laboratory exercises will not receive these points. • Two partial exams (maximum 2x20 points) • Drafting of preparation materials for laboratory exercises and presentation of results of laboratory exercises (maximum 10 points) • Implementation of the final project (maximum 10 points) • Final exam (maximum 30 points) During the semester, students take two written partial exams in which they resolve problems related to topics covered during the course. A student who fails to obtain at least 10 points in every of the partial exams takes the re-examination. During the final exam, students verbally reply to questions on issues discussed during lectures and laboratory exercises and demonstrate solutions of simpler versions of similar problems. In order to obtain a positive final grade, a student has to obtain at least 55 points, including: attendance, preparations and presentations of laboratory exercises and projects, partial exams and the final exam.
In the case of 4-B, choose one topic from the chosen programme, and write assessment criteria and procedures	Subject: Computer graphics The exam consists of three periodical written tests during the semester, three practical tests during exercises (2D raster, 2D vector, 3D vector), and the final written exam. Quantitative assessment criteria: 30% active participation in lectures (periodical tests) 30% active participation in exercises (periodical tests) 40% final exam

5. Analysing chosen programmes and topics, discuss the harmonisation between intended learning outcomes and assessment criteria and procedures

The manner of assessment is generally the same for all subjects.
There is a difference between the practical and theoretical part of the exam.

6. Write all challenges during the work and overcome.

Lack of understanding of the difference between the terms competence / learning outcomes. In most teaching programmes, study programme competences are stated as "profile qualifications", and learning outcomes as "competences".

The listed study programmes include many programmes that do not strictly belong to the 5 fields defined by the international professional organisations. Some of the programmes are fully compliant, some are partially compliant, and some programmes are a combination of ICT field with other disciplines (mathematics, mechanical engineering, electrical engineering, management, etc.).