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# ***DigiS: Building up a Digital Skills Alliance for the Enhancing of Programming Competencies***

## **JOINT QUALIFICATION STANDARD**

### ***Virtual Reality Applications Programmer and Developer***

EQF level 4

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## Methodology

The aim of this part of the text is to describe the content of individual items and the methodological basis for why they contain given text. Our aim below is to explain what the individual chapters' titles mean, why we proceeded in the way and what we want to achieve.

*Vocational qualification* is defined as “*the ability of a person to properly perform a certain work activity or a set of work activities in a certain profession, or in two or more professions*”. The sets of activities defined in this way are usually more briefly defined than the specific occupations for which the so-called "Job Description" is defined and which allow a certain professional fulfilment. The definition of the professional qualification is based on the "Job Description" - see separate files.

Each *vocational qualification* has its own *qualification standard* and *evaluation standard*.

A *qualification standard* is a structured description of the professional competence of a person for the proper performance of a certain work activity or set of work activities in a certain profession, or in two or more professions. The *qualification standard* determines what knowledge and skills the applicant should have in the given profession. The *qualification standard* is defined by the so-called vocational qualification, which introduces professional competence.

An *assessment standard* is defined as “*a set of criteria and organizational and methodological procedures established for verifying the attainment of professional competence to perform a certain work activity properly or a set of work activities in a certain profession, or in two or more ones*”. The assessment standard of a professional qualification sets out how to verify whether an applicant for a certain professional qualification meets the requirements (i.e. competences) set for this qualification in its qualification standard. The *assessment standard* follows the qualification standard and determines the evaluation criteria and methods of verification of individual requirements (i.e. competencies) of the qualification standard. While competencies describe what a candidate must demonstrate, the evaluation criteria describe how to prove it. The *assessment standard* is further defined by the *evaluation criteria* and the *method of verification*.

When formulating the evaluation criteria, it is necessary to respect their clarity and feasibility in order an examiner be able to decide whether or not the examinee has validated competence, not to allow more possible interpretations, to be verifiable and applicable in each evaluation as much as possible and not to allow striking differences in test claims.

The criteria must be formulated in a comprehensible manner so that they are clear to both the examiners and the examinees and, at the same time, ensuring whether or not the examinee has met a criterion. The criteria can be focused both on the process, i.e. on the verification of how the examinee performs the assigned task, and on the result, i.e. on the verification of what the examinee performed, executed or created.

## 1 Qualification standard

### 1.1 Vocational knowledge and skills

- Analysis and algorithmization of practical tasks
- Creation of the application for virtual reality in selected software
- Verification of the application's functionality and testing optimality of the algorithm
- Processing systemic documentation of the created code and data for user's documentation
- Knowledge of the software and hardware for virtual reality
- Putting application of the virtual reality into operation at a customer's place

### 1.2 Digital competences

- Analyses of customers' needs, conditions and environment
- Principles of programming and program languages
- Informatics and characteristics of information systems
- Projection / Designing information systems
- Tasks' algorithmization
- Integrated development environment, software's testing and localization, operating systems

### 1.3 General skills

- Computer skills
- Legal knowledge
- Language proficiency in national language
- Language proficiency in English language

### 1.4 Soft skills

- Flexibility
- Autonomy
- Problem solving
- Lifelong learning
- Active approach
- Team cooperation
- Work planning and organizing
- Search capabilities and orientation in information

## 2 Assessment standard

In Assessment standard can be found description of single vocational competences, their evaluation criteria and methods of knowledge verification.

### 2.1 Vocational competence

- Analysis and algorithmization of practical tasks
- Creation of the application for virtual reality in selected program
- Verification of the application's functionality and testing algorithm's optimality
- Processing systemic documentation of the created code and data for user's documentation
- Knowledge of the software and hardware for virtual reality
- Putting application of the virtual reality into operation at a customer's place

#### 2.1.1 Analysis and algorithmization of practical tasks

Evaluation criteria	Method of verification
<p><i>Carry out analysis of the needs and goals of the practical assignment:</i></p> <ul style="list-style-type: none"> <li>• Analyse time responses of the algorithms;</li> <li>• Decompose systems to individual functional blocks and their reciprocal data interfaces;</li> <li>• Propose list of needed constants and variables including data types;</li> <li>• Specify quantities that can be parametrized</li> </ul> <p><i>Carry out task's algorithmization:</i></p> <ul style="list-style-type: none"> <li>• Propose flow diagrams for single functional blocks;</li> <li>• Determine priorities of realization and sequences of the functional blocks</li> </ul>	Practical demonstration and/or oral verification and/or written verification (depending on national regulations)
<p><i>Student has to be prepared to demonstrate knowledge of all criteria but will be examined based on instructions provided by examiner.</i></p>	

#### 2.1.2 Creation of the application for virtual reality in selected program

Evaluation criteria	Method of verification
<p><i>Implement created algorithm into selected program code, suitably use data and program means of the selected environment:</i></p> <ul style="list-style-type: none"> <li>• Rewrite single steps of algorithm in selected program code;</li> <li>• Define variables and invariables by way of selected code;</li> <li>• Define modules by selected code, use standard and own</li> </ul>	Practical demonstration and/or oral verification and/or written verification (depending on national regulations)

<p>libraries;</p> <ul style="list-style-type: none"> <li>• Complete single steps with suitable description and notes.</li> </ul> <p><i>Fine-tuning of created application:</i></p> <ul style="list-style-type: none"> <li>• Remove syntax errors with compiler;</li> <li>• Animate single functions, find and remove possible differences with regard to defined flow diagrams;</li> <li>• Complete comments that document status of the program functioning;</li> <li>• Create 3D model of the object, use Blender program, create 3D model of the scene, create static model, unfold model into 2D space;</li> <li>• set 3D model in motion with Unity3D engine, picture scenes, set scene into motion with scripts in C#, add sound to the scene;</li> </ul> <p><i>Development tools´ update:</i></p> <ul style="list-style-type: none"> <li>• Search for needed version of development tool for given HW.</li> </ul>	
<p><i>Student has to be prepared to demonstrate knowledge of all criteria but will be examined based on instructions provided by examiner.</i></p>	

### 2.1.3 Verification of the application´s functionality and testing algorithm´s optimality

Evaluation criteria	Method of verification
<p><i>Define set of testing values to verify algorithm´s correctness:</i></p> <ul style="list-style-type: none"> <li>• Propose sequence of input testing signals (logic, analogue, communicated);</li> <li>• Propose method to verify regulation loops;</li> <li>• Verify functionality of the mutual links among functional blocks</li> </ul>	<p>Practical demonstration and/or oral verification and/or written verification (depending on national regulations)</p>
<p><i>Student has to be prepared to demonstrate knowledge of all criteria but will be examined based on instructions provided by examiner.</i></p>	

### 2.1.4 Processing systemic documentation of the created code and data for user´s documentation

Evaluation criteria	Method of verification
<p><i>Define structure of documentation of created solution:</i></p> <ul style="list-style-type: none"> <li>• Create well-arranged report of the single requirements and goals based on assignment;</li> <li>• Describe transparent group of testing data with justification that affects all variants of the solution and testing all ways</li> </ul>	<p>Practical demonstration and/or oral verification and/or written verification (depending on national regulations)</p>

<p>in proposed solution.</p> <p><i>Compile software documentation:</i></p> <p>Describe bonds between single requirements and goals towards used means – variables, invariables, functional blocks</p> <ul style="list-style-type: none"> <li>• Describe and document implemented algorithms;</li> <li>• Supplement created code with commentaries related to individual program's sections that improve code's readability, improve code's transparency with formal arrangement of the records (justification and indentation) with formal;</li> <li>• Ensure logical link-up and improve orientation in program's code, describe used libraries and their position;</li> <li>• Document topically used versions of systemic and user libraries and topical version of the development environment;</li> <li>• Deposit sourced and compiled form of the program.</li> </ul>	
<p><i>Student has to be prepared to demonstrate knowledge of all criteria but will be examined based on instructions provided by examiner.</i></p>	

### 2.1.5 Knowledge of the software and hardware for virtual reality

Evaluation criteria	Method of verification
<p><i>Verify HW functionality in real conditions and concrete sectors of possible use.</i></p> <p><i>Verify SW functionality in real conditions; verify parametrization of algorithms for given application;</i></p> <p><i>Test application in real practice and diagnose its operational modes and errors:</i></p> <ul style="list-style-type: none"> <li>• Test how to connect common VR tools (various headsets, use of applications for VR.</li> </ul>	<p>Practical demonstration and/or oral verification and/or written verification (depending on national regulations)</p>
<p><i>Student has to be prepared to demonstrate knowledge of all criteria but will be examined based on instructions provided by examiner.</i></p>	

### 2.1.6 Putting application of the virtual reality into operation at a customer's place

Evaluation criteria	Method of verification
<p><i>Verify basic knowledge regarding choice of suitable HW and SW for concrete VR applications:</i></p> <ul style="list-style-type: none"> <li>• Verify competence in basic knowledge of graphic programming, 3D modelling and capability in selection of suitable designing SW used for development of the applications/solutions, prove basic knowledge of the</li> </ul>	<p>Written and/or oral verification (depending on national regulations)</p>

computer networks

*Student has to be prepared to demonstrate knowledge of all criteria but will be examined based on instructions provided by examiner.*

## 2.2 Instructions for carrying out exams

The authorized person shall inform which documents the candidate must submit for the examination in accordance with the applicable legal regulations. Before starting the self-verification, the examinee must get acquainted with the requirements of safety and health at work and fire protection, about which a written record will be prepared by an authorized person and signed by the examinee. Medical fitness to perform the work activities of this professional qualification is advised based on country specifications.

Verification of specified competencies consists in verifying the candidate's ability to perform the specified operation according to the specified work procedure, to properly perform activities related to programming and development of applications for virtual reality. The examination covers written and/or oral verification and practical part – it depends on national regulations.

- Written part of the exam can be either test or elaboration of the more complex task.
- Oral part of the exam is usually designed as a structured interview that can be accompanied with questions related to written part of the exam.
- Practical part of the exam should consist of selection of the task(s) by examinee, preparation for their fulfilment and subsequent execution.

Student has to be prepared to demonstrate knowledge of all criteria but will be examined based on instructions provided by examiner. It is expected the course of exam in a way that the examinee will randomly draw one or more topics from the vocational competencies. Depending on national regulations, it is recommended to limit the number of the vocational competencies at the exam between 2 - 4.

Methods of verification are indicative and their choice and their combination depends on habitual practice in a country/school where exam is carried out.

## 2.3 Final assessment

The examiner evaluates the examinees based on national requirements and result is entered into document about course and result of the exam. The final assessment for a given competence must be "passed" or "failed". The final assessment of the whole exam is either "passed" if the candidate has met all requirements, or "failed" if the candidate has not fulfilled some of the competencies. When evaluating results in "failed", the examiner always states the justification, which the candidate acknowledges with his / her signature.

## 2.4 Number of examiners

The exam takes place in front of authorized person(s) based on national requirements; the examiner is authorized for the relevant professional qualification or he/she is authorized representative of an authorized physical or legal entity, authorized to test relevant professional qualification.

## 2.5 Requirements regarding vocational competence of the authorized person resp. a representative of the authorized person

It is recommended that an authorized person, resp. the authorized representative of the authorized person should meet at least one of the following variants of requirements (depending on national regulations and availability):



- Secondary education with an apprenticeship certificate in the field of education focused on IT + at least 5 years of professional experience in the field of IT or demonstrable experience as a teacher of practical teaching at secondary schools or colleges in the field of SW programming.
- Secondary education with an apprenticeship certificate in the field of education focused on IT and secondary education with a school-leaving examination + at least 5 years of professional experience in the field of IT or as a teacher of practical teaching or professional training in the field of IT.
- Secondary education with a school-leaving examination in the field of education focused on IT + at least 5 years of professional experience in the field of IT or as a teacher of practical teaching or professional training in the field of IT.
- University education in the study program IT + at least 5 years of professional experience in operation or in a section including a workplace with activities in the field of IT or as a teacher of professional subjects in the field of IT.

## 2.6 Further requirements

Authorized person, resp. authorized representative of an authorized person that does not have a professional qualification of a pedagogical worker or does not have a professional qualification or experience in adults' education (including practice in examining) or does not have a certificate of professional qualification, must be able to organize the examination process including evaluation on PC and issue certificate (submission of statutory declaration is satisfactory). The applicant for an authorization shall demonstrate compliance with the requirements for professional competence by submitting a document or a set of documents on the acquisition of professional competence to the authorizing body or by another procedure specified by the authorizing body.

## 2.7 Material and technical necessities for exam completion

It is recommended for workplace focused on teaching virtual reality and software programming that should dispose of the following equipment:

- PC series or Mac series computer
- Specific SW and HW for creating applications in the field of virtual reality
- Protective aids to ensure work safety
- Room for the written part of the exam
- Stationery and paper

Authorized person, resp. the authorized representative of the authorized person must ensure that the workplace is properly arranged and equipped so that the working conditions for the execution of the exam in terms of safety and health at work and fire protection correspond to safety requirements and hygienic limits for the working environment. The authorized person shall attach to the application for authorization a list of material and technical equipment demonstrating compliance with the requirements specified in the assessment standard for the purposes of the exam. The authorized person proves the provision of suitable premises for the examination by an appropriate document (e.g. extract from the real estate cadastre, lease agreement, an agreement) enabling their use for the period of validity of the authorization.



## 2.8 Pre-exam time

The examinee is entitled to prepare for an exam within 45 minutes. The time of preparation for the exam does not include the time devoted to familiarization with the place where exam takes place and to instructions related to the requirements of occupational health and safety and fire safety.

## 2.9 Exam time

Total exam time for one examinee is usually 1 - 4 hours (excluding breaks and pre-exam time), this matter will be specified with regard to the national requirements. One hour is usually 45 up to 60 minutes. Exam can be split into more days if needed.