European Software
Skills Alliance.

ESSA Learning programmes

ANNEX III
Developer EQF 7

30 November 2023

Status: Final version

Co-funded by the
Erasmus+ Programme
of the European Union

ESSA Learning programme – Developer EQF 7, 2023.

Deliverable 10 – ESSA Learning Programmes & Materials – ANNEX III

This document is a draft version and is subject to change after review coordinated by the European Education and Culture Executive Agency (EACEA).

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About ESSA

The European Software Skills Alliance (ESSA) is a four-year transnational project funded under the EU's Erasmus+ programme. It ensures the skills needs of the rapidly evolving Software sector can be met — today and tomorrow.

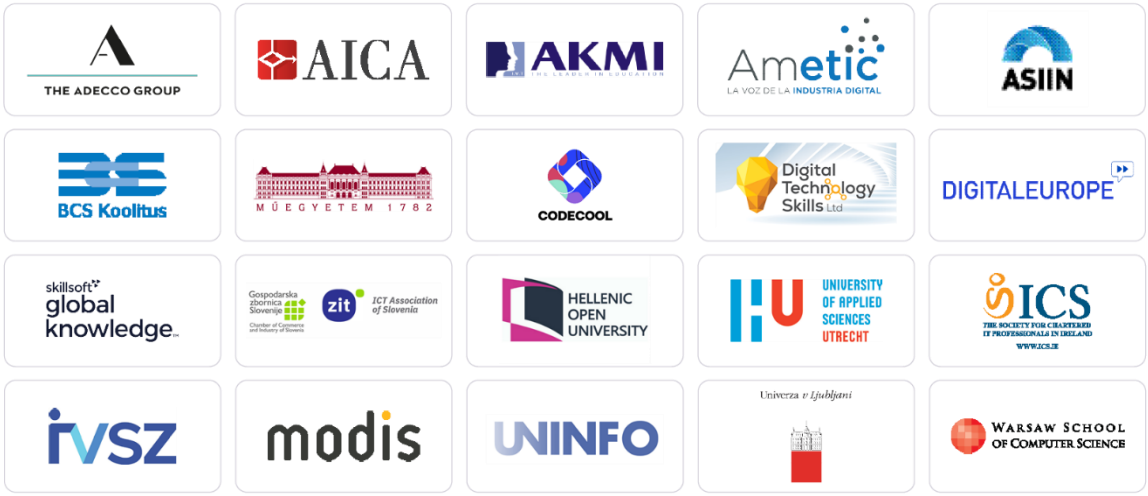
ESSA provides current and future software professionals, learning providers and organisations with software needs with the educational and training instruments they need to meet the demand for software skills in Europe.

ESSA will develop a European Software Skills Strategy and learning programmes for Europe. It will address skill mismatches and shortages by analysing the sector in depth and delivering future-proof curricula and mobility solutions; tailored to the European software sector's reality and needs.

Project partners

The ESSA consortium is led by DIGITALEUROPE. It is composed of academic and non-academic partners from the education, training, and software sectors.

View all project partners: ESSA Partners | ESSA Associated Partners



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List of abbreviations and acronyms

Abbreviation	Term
e-CF, EN 16234-1	European e-Competence Framework, European Norm 16234 - Part 1: Framework
ECTS	European Credit Transfer and Accumulation System
EQF	European Qualifications Framework
ESSA	European Software Skills Alliance
LO	Learning Outcome
PLO	Programme Learning Outcome

1 Developer EQF 7 - ESSA Learning Programme

1.1 Post graduate students with the purpose to upskill or reskill with developer full stack competences

Executive summary

The Developer full stack curriculum is being designed by Warsaw School of Computer Science (PL). It is one of the two training units made up from full MSc model curriculum, dedicated to Developer's role for the purpose of ESSA piloting. The Developer full stack curriculum is an EQF level 7 programme to be used primarily at higher education institutions. The curriculum may be used as a separate full stack training programme (20 ECTS) or as a basic part of MSc full studies in advanced full stack developer software engineering course (120 ECTS). The targeted groups are post graduate students with the purpose to upskill or reskill with developer full stack competences. The curriculum is made up of 8 learning units covering 510 study hours (192 contact hours). Recommended delivery method is blended (presence classroom/virtual classroom) but also other methods and platforms may be used such as e-learning platforms i.e. moodle. The main objectives of the course are to familiarize participants with various aspects of advanced programming tasks in the context of frontend and backend development. The course program covers topics related to understanding project requirements and interpreting design documentation, implementing IT solutions using modern techniques, tools, and software development standards. An important element of the course also includes cloud-based approaches and selected aspects related to implementing solutions that require both a team-oriented approach and knowledge of DevOps techniques and solutions. The curriculum's takes into account local characteristics adapted to context of national labour market. Current technology maturity state and future direction in software engineering development and the legal context are included. Also best international practices are considered in the curriculum.

1.1.1 PLO 1. Application Design [e-4]

1. PLO Application Design [e-4]	
The learner has demonstrated capability *→ to specify a design for an advanced/ innovative solution, software application or component*	
Unit learning outcomes	Assesses needs of customers, users, and stakeholders and formulates requirements and functional specifications, taking into account overall business needs (e.g., by performing a requirements analysis)
	Specifies a design for an advanced/ innovative solution, software application or component, taking into account specific constraints/ requirements (e.g., related to machine learning, cloud, big data, blockchain, IoT; constraints such as e.g., impact on the organisation/ business/ society; the development environment, programming language, technology, requirements related to performance, security, accessibility, usability, privacy, ethics, safety, IS policy, cost, quality)

1.1.1.1 Duration of Study

Recommended duration: starting from 1,5 ECTS

Often integrated with studies of PLOs:

1.1.1.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the advanced studies for students with prior knowledge of software development.
- *Recommended as an independent micro-credential for upskilling developers.*

1.1.1.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.1.1.4 WBL and Follow-up Reinforcement

After learning the basic principles, terminology, and models of software design, the study should focus on analysing and simulating real work-life-like tasks as, for example:

- Implementation of Business/Industry Projects
- Industry practitioner - led session

1.1.1.5 Important (new) approaches and technologies to consider

n/a

1.1.1.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Assesses needs of customers, users, and stakeholders and	Practical assignment, exam	Assessment (of skills)

formulates requirements and functional specifications, taking into account overall business needs (e.g., by performing a requirements analysis)		
Specifies a design for an advanced/ innovative solution, software application or component, taking into account specific constraints/ requirements	Practical assignment, exam	Assessment (of skills)

1.1.2 Learning Resources - PLO 1. Application Design [e-4]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Software engineering I: Software modelling and architecture	7	1,5 ECTS	Blended	Practical assignment exam	Modelling and analysis of information systems Advanced Software Engineering Design Patterns and Architectural Applications	Lecture/project	1.1 Modeling and analysis of information systems 1.2.Advanced Software Engineering 1.3 Design Patterns and Architectural Applications
Software engineering II: *DevOps*	7	1,5 ECTS	Blended	Practical assignment exam	Methods and Tools for CI & CD in Software Development Processes	Lecture/project	6. Software engineering II DevOps
Software development methods and paradigms II: Object-oriented	7	3 ECTS	Blended	Practical assignment exam	Advanced Object-Oriented Design Concurrent Programming Unit Testing	Lecture/project	3.1 Advanced Object-Oriented Design 3.2 Concurrent Programming 3.3 Unit Testing
Software development	7	3 ECTS	Blended	Practical assignment	Application and Website Design	Lecture/project	4.1 Application and Website Design

methods and paradigms III: Internet software development				exam	Creating Applications and Websites (I) Creating Applications and Websites (II)		4.2 Creating Applications and Websites (I) 4.3 Creating Applications and Websites (II)
Cloud-based software development	7	1,5 ECTS	Blended	Practical assignment	Creating Cloud Applications Cloud Service Management	Lecture/project	5.Cloud-based software development

1.1.3 PLO 2. Application Development [e-4]

2. PLO Application Development [e-4]	
The learner has demonstrated capability *→ to creatively develop and validate an advanced/ innovative solution, software application or component*	
Unit learning outcomes	Writes complex code and related documentation to it, taking into account relevant principles and constraints
	Creates an advanced/ innovative working software component or application, that satisfies its requirements, applying complex techniques and tools (e.g., embedded software, cloud-based applications; related to e.g., machine learning, cloud, big data, blockchain, IoT)

1.1.3.1 Duration of Study

Recommended duration: starting from 2,5 ECTS

Often integrated with studies of PLOs:

1.1.3.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the advanced studies for students with prior knowledge of software development.
- *Recommended as an independent micro-credential for upskilling developers.*

1.1.3.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.1.3.4 WBL and Follow-up Reinforcement

n/a

1.1.3.5 Important (new) approaches and technologies to consider

n/a

1.1.3.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Writes complex code and related documentation to it, taking into account relevant principles and constraints	Practical assignment, exam	Assessment (of skills)
Creates an advanced/ innovative working software component or application, that satisfies its requirements, applying complex techniques and tools	Practical assignment, exam	Assessment (of skills)

1.1.4 Learning Resources - PLO 2. Application Development [e-4]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Software development methods and paradigms I: Fundamentals of programming and algorithms	7	2,5 ECTS	Blended	Practical assignment exam	Foundations and Programming Methods Creating Applications Using Integrated Development Environments	Lecture, practical assignment	2.1. Foundations and Programming Methods 2.2 Creating Applications Using Integrated Development Environments
Software development methods and paradigms II: Object-oriented programming	7	3 ECTS	Blended	Practical assignment exam	Advanced Object-Oriented Design Concurrent Programming Unit Testing	Lecture/project	3.1 Advanced Object-Oriented Design 3.2 Concurrent Programming 3.3 Unit Testing
Software development methods and paradigms III: Internet software development	7	3 ECTS	Blended	Practical assignment exam	Application and Website Design Creating Applications and Websites (I) Creating Applications	Lecture/project	4.1 Application and Website Design 4.2 Creating Applications and Websites (I) 4.3 Creating Applications and Websites (II)

					and Websites (II)		
Cloud-based software development	7	1,5 ECTS	Blended	Practical assignment	Creating Cloud Applications Cloud Service Management	Lecture/project	5.Cloud-based software development

1.1.5 PLO 3. Component Integration [e-4]

3. PLO Component Integration [e-4]	
The learner has demonstrated capability *→ to provide expert guidance or advice on integration of an advanced/ innovative solution, software application or component*	
Unit learning outcomes	Creates and guides a process for integration of an advanced/ innovative solution, software application or component (e.g., proposes standards of practice; for a solution related to e.g., machine learning, cloud, big data, blockchain, IoT)
	Writes a report/ advisory report/ paper/ research article on integration of a solution or software application in an innovative/ advanced/ complex situation (e.g., an analysis of software integration challenges related to a particular technology or method, a process/HR/internal standards design for an integration cycle, a resource assignment plan)

1.1.5.1 Duration of Study

Recommended duration: starting from 1,5 ECTS

Often integrated with studies of PLOs:

1.1.5.2 Recommendations for Micro-credentials

- *This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.*
- *Recommended as an independent micro-credential for upskilling junior developers.*

1.1.5.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.1.5.4 WBL and Follow-up Reinforcement

n/a

1.1.5.5 Important (new) approaches and technologies to consider

n/a

1.1.5.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Creates and guides a process for integration of an advanced/ innovative solution, software application or component (e.g., proposes standards of practice; for a solution related to e.g., machine learning, cloud, big data, blockchain, IoT)	Practical assignment, exam	Assessment (of skills)
Writes a report/ advisory report/ paper/ research article on integration of a solution or software application in an innovative/ advanced/ complex situation	Practical assignment, exam	Assessment (of skills)

1.1.6 Learning Resources - PLO 3. Component Integration [e-4]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Software development methods and paradigms II: Object-oriented programming	7	3 ECTS	Blended	Practical assignment exam	Advanced Object-Oriented Design Concurrent Programming Unit Testing	Lecture/project	3.1 Advanced Object-Oriented Design 3.2 Concurrent Programming 3.3 Unit Testing
Software development methods and paradigms III: Internet software development	7	3 ECTS	Blended	Practical assignment exam	Application and Website Design Creating Applications and Websites (I) Creating Applications and Websites (II)	Lecture/project	4.1 Application and Website Design 4.2 Creating Applications and Websites (I) 4.3 Creating Applications and Websites (II)
Software engineering II: DevOps	7	1,5 ECTS	Blended	Practical assignment exam	Methods and Tools for CI & CD in Software Development Processes	Lecture/project	6. Software engineering II DevOps

1.1.7 PLO 4. Testing [e-4]

4. PLO Testing [e-4]	
The learner has demonstrated capability *→ to provide expert guidance or advice on testing an advanced/ innovative solution, software application or component*	
Unit learning outcomes	Creates and guides a process for testing an advanced/ innovative solution, software application or component (e.g., proposes standards of practice; for a solution related to e.g., machine learning, cloud, big data, blockchain, IoT)
	Writes a report/ advisory report/ paper/ research article on a topic related to testing of an innovative/ advanced/ complex solution, software application or component or on issues regarding testing in specific situations (e.g., agile testing, a process design for an entire testing activity, specification of internal standards of practice for testing, test management plan for CI testing)

1.1.7.1 Duration of Study

Recommended duration: starting from 1,5 ECTS

Often integrated with studies of PLOs:

1.1.7.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling developers.

1.1.7.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20+%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.1.7.4 WBL and Follow-up Reinforcement

n/a

1.1.7.5 Important (new) approaches and technologies to consider

n/a

1.1.7.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Creates and guides a process for testing an advanced/ innovative solution, software application or component (e.g., proposes standards of practice; for a solution related to e.g., machine learning, cloud, big data, blockchain, IoT)	Practical assignment exam	Assessment (of skills)
Writes a report/ advisory report/ paper/ research article on a topic related to testing of an innovative/ advanced/ complex solution, software application or component or on issues regarding testing in specific situations (e.g., agile testing, a process design for an entire testing activity, specification of internal standards of practice for testing, test management plan for CI testing)	Practical assignment exam	Assessment (of skills)

1.1.8 Learning Resources - PLO 4. Testing [e-4]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Software development methods and paradigms II: Object-oriented programming	7	3 ECTS	Blended	Practical assignment exam	Advanced Object-Oriented Design Concurrent Programming Unit Testing	Lecture/project	3.1 Advanced Object-Oriented Design 3.2 Concurrent Programming 3.3 Unit Testing
Software development methods and paradigms III: Internet software development	7	3 ECTS	Blended	Practical assignment exam	Application and Website Design Creating Applications and Websites (I) Creating Applications and Websites (II)	Lecture/project	4.1 Application and Website Design 4.2 Creating Applications and Websites (I) 4.3 Creating Applications and Websites (II)
Software engineering II: DevOps	7	1,5	Blended	Practical assignment exam	Methods and Tools for CI & CD in Software Development Processes	Lecture/project	6. Software engineering II DevOps
Cloud-based software development	7	1,5 ECTS	Blended	Practical assignment	Creating Cloud Applications Cloud Service Management	Lecture/project	5.Cloud-based software development

1.1.9 PLO 5. Profession related competences [EQF7]

5. PLO Profession related competences [EQF7]	
The learner has demonstrated capability *→ to apply profession related skills*	
Unit learning outcomes	Advises on the application of a new technology. Given a certain situation or context, writes a report with recommendations or an advice on a solution that involves the application of a new technology. Reflects critically on a new technology.
	Analyses, improves, and provides expert advice and guidance on security standards, regulations, measures, methods, tools, and techniques, taking into account the broader business context and current IT developments
	Analyses, improves, and provides expert advice and guidance on sustainability standards, regulations, measures, and methods, taking into account the broader business context and current IT developments
	Is continuously aware of ethical considerations and issues and applies these in professional context and activities. Forms and communicates an opinion based on incomplete and or limited information, taking into account social, scientific and ethical responsibilities related to the application of own knowledge and opinions. Promotes ethical thinking

1.1.9.1 Duration of Study

Recommended duration: starting from 1,5 ECTS

Often integrated with studies of PLOs:

1.1.9.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling developers.

1.1.9.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

n/a

Recommended delivery methods:

- Lecture ☒ up to 80%
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.1.9.4 WBL and Follow-up Reinforcement

n/a

1.1.9.5 Important (new) approaches and technologies to consider

n/a

1.1.9.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Advises on the application of a new technology. Given a certain situation or context, writes a report with recommendations or an advice on a solution that involves the application of a new technology. Reflects critically on a new technology.	Practical assignment	Assessment (of skills)
Analyses, improves, and provides expert advice and guidance on security standards, regulations, measures, methods, tools, and techniques, taking into account the broader business context and current IT developments	Practical assignment	Assessment (of skills)
Analyses, improves, and provides expert advice and guidance on sustainability standards, regulations, measures, and methods, taking into account the broader business context and current IT developments	Practical assignment	Assessment (of skills)
Is continuously aware of ethical considerations and issues and applies these in professional context and activities. Forms and communicates an opinion based on incomplete and or limited information, taking into account social, scientific and ethical responsibilities related to the application of own knowledge and opinions. Promotes ethical thinking	Practical assignment	Assessment (of skills)

1.1.10 Learning Resources - PLO 5. Profession related competences [EQF7]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Fundamentals of Law for IT	7	1 ECTS	Blended	Practical assignment	*Fundamentals of Law for IT*	Lecture/project	7. Fundamentals of Law for IT

1.1.11 PLO 6. Soft competences [EQF7]

6. PLO Soft competences [EQF7]	
The learner has demonstrated capability *→ to apply soft skills*	
Unit learning outcomes	Related to the occupation, knowledge domain, and field of science, critically collects: in-depth and detailed professional and scientific information on a range of basic theories, principles and concepts, as well as information on some important current issues and topics. Analyses, evaluates, and combines critically this information, knowledge and insights and presents this in a scientific way. Critically applies/ translates/ interprets results of research (possibly executed by others) to the own context (the occupation and/or knowledge domain). Executes detailed scientific research
	Exercises (self-)management in situations that are complex, unpredictable and require new strategic approaches. Is able to cope with change (positive or negative), to adapt to a considerable level of variety in the workplace and to transform the work or study context. Handles pressure and setbacks and maintains composure. Shows initiative, creativity and originality and carries responsibility for the results of own activities, work and or study and for the work results of others. Works correctly and carefully, fully aware of the importance of trustworthiness and accountability.
	Realises learning and personal development, mostly autonomous and based on intrinsic motivation, looking for personal learning objectives. Selects and uses training/instructional methods and procedures appropriate for the situation when learning or teaching new things.

1.1.11.1 Duration of Study

Recommended duration: starting from 1 ECTS

Often integrated with studies of PLOs:

1.1.11.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling junior developers.

1.1.11.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

n/a

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.1.11.4 WBL and Follow-up Reinforcement

n/a

1.1.11.5 Important (new) approaches and technologies to consider

n/a

1.1.11.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Related to the occupation, knowledge domain, and field of science, critically collects: in-depth and detailed professional and scientific information on a range of basic theories, principles and concepts, as well as information on some important current issues and topics. Analyses, evaluates, and combines critically this information, knowledge and insights and presents this in a scientific way. Critically applies/ translates/ interprets results of research (possibly executed by others) to the own context (the occupation and/or knowledge domain). Executes detailed scientific research	Practical assignment	Assessment (of skills)
Exercises (self-)management in situations that are complex, unpredictable and require new strategic approaches. Is able to cope with change (positive or negative), to adapt to a considerable level of variety in the workplace and to transform the	Practical assignment	Assessment (of skills)

work or study context. Handles pressure and setbacks and maintains composure.		
Shows initiative, creativity and originality and carries responsibility for the results of own activities, work and or study and for the work results of others.	Practical assignment	Assessment (of skills)

1.1.12 Learning Resources - PLO 6. Soft competences [EQF7]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Fundamentals of Agile Team Management	7	1 ECTS	Blended	Practical assignment	*Fundamentals of Agile Team Management*	Lecture, practical assignment	8.Fundamental_of_Agile_Team_Management
Diploma thesis design	7	5 ECTS	Blended	Diploma exam	*Diploma thesis design*	Lecture, practical assignment	9. Diploma thesis design
Fundamentals of Law for IT	7	1 ECTS	Blended	Practical assignment	*Fundamentals of Law for IT*	Lecture, practical assignment	7. Fundamentals of Law for IT

1.1.13 PLO 7. Functioning in organisation [EQF7]

7. PLO Functioning in organisations [EQF7]	
The learner has demonstrated capability *→ to function in an organisational context*	
Unit learning outcomes	Explains organisation theory and behaviour
	Describes the relationship between business and IT
	Works in an organisational context under broad direction, performing coordinating activities, with at least 3 years of working experience at an intermediate or senior level, as e.g., a specialist, team leader, manager, or a comparable role
	Leads a project
	Writes a report on functioning in organisation

1.1.13.1 Duration of Study

Recommended duration: starting from 1 ECTS

Often integrated with studies of PLOs:

1.1.13.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling developers.

1.1.13.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.1.13.4 WBL and Follow-up Reinforcement

n/a

1.1.13.5 Important (new) approaches and technologies to consider

n/a

1.1.13.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Explains organisation theory and behaviour	Practical assignment	Assessment (of skills)
Describes the relationship between business and IT	Practical assignment	Assessment (of skills)
Works in an organisational context under broad direction, performing coordinating activities, with at least 3 years of working experience at an intermediate or senior level, as e.g., a specialist, team leader, manager, or a comparable role	Practical assignment	Assessment (of skills)
Leads a project	Practical assignment	Assessment (of skills)
Writes a report on functioning in organisation	Practical assignment	Assessment (of skills)

1.1.14 Learning Resources - PLO 7. Functioning in organisation [EQF7]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Fundamentals of Law for IT	7	1	Blended	Practical assignment, report	*Fundamentals of Law for IT*	Lecture	7. Fundamentals of Law for IT
Fundamentals of Agile Team Management	7	1	Blended	Practical assignment	*Fundamentals of Agile Team Management*	Lecture, practical assignment	8.Fundamental_of_Agile_Team_Management

1.1.15 EXTRA CURRICULAR PLO: New Technology [EQF7]

PLO New Technology [EQF7]	
Unit learning outcomes	Given a certain situation or context, writes a report with recommendations or an advice on a solution that involves the application of (a method, technique or tool related to) a new technology, considering specific issues related to this technology (e.g., impact on the organisation/ business/ society; security, ethical issues)
	Writes a critical reflection on a new technology

1.1.15.1 Duration of Study

Recommended duration: starting from 1,5 ECTS

Often integrated with studies of PLOs:

1.1.15.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling junior developers.

1.1.15.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

n/a

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.1.15.4 WBL and Follow-up Reinforcement

n/a

1.1.15.5 Important (new) approaches and technologies to consider

n/a

1.1.15.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Given a certain situation or context, writes a report with recommendations or an advice on a solution that involves the application of (a method, technique or tool related to) a new technology, considering specific issues related to this technology (e.g., impact on the organisation/ business/ society; security, ethical issues)	Practical assignment	Assessment (of skills)

1.1.16 Learning Resources - EXTRA CURRICULAR PLO: New Technology [EQF7]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Software development methods and paradigms III: Internet software development	7	3 ECTS	Blended	Practical assignment exam	Application and Website Design Creating Applications and Websites (I) Creating Applications and Websites (II)	Lecture/project	4.1 Application and Website Design 4.2 Creating Applications and Websites (I) 4.3 Creating Applications and Websites (II)
Cloud-based software development	7	1,5 ECTS	Blended	Practical assignment	Creating Cloud Applications Cloud Service Management	Lecture/project	5.Cloud-based software development

1.2 Post graduate students with the purpose to upskill or reskill with developer full stack competences – Developer Database

Executive summary

The Developer database curriculum is being designed by Warsaw School of Computer Science (PL). It is one of the two training units made up from full MSc model curriculum, dedicated to Developer's role for the purpose of ESSA piloting. The Developer database curriculum is an EQF level 7 programme to be used primarily at higher education institutions. The curriculum may be used as a separate Developer database training programme (20 ECTS) or as a basic part of MSc full studies in advanced Developer database software engineering course (120 ECTS). The Developer Database curriculum is an EQF level 7 programme to be used primarily at higher education institutions. The targeted groups are post graduate students with the purpose to upskill or reskill with developer full stack competences. The curriculum is made up of 8 learning units covering 510 study hours (192 contact hours). Recommended delivery method is blended (presence classroom/virtual classroom) but also other methods and platforms may be used such as e-learning platforms i.e. moodle. The primary objectives of the course are to familiarize participants with various aspects of programming tasks in the context of databases. The course program covers issues of database design and implementation, database administration, database object programming in T-SQL or CLR. An important element of the course are issues related to the use of data in advanced analytical tasks implemented in R and Python. The curriculum's takes into account local characteristics adapted to context of national labour market. Current technology maturity state and future direction in software engineering development and the legal context are included. Also best international practices are considered in the curriculum.

1.2.1 PLO 1. Application Design [e-4]

1. PLO Application Design [e-4]	
The learner has demonstrated capability *→ to specify a design for an advanced/ innovative solution, software application or component*	
Unit learning outcomes	Assesses needs of customers, users, and stakeholders and formulates requirements and functional specifications, taking into account overall business needs (e.g., by performing a requirements analysis)
	Specifies a design for an advanced/ innovative solution, software application or component, taking into account specific constraints/ requirements (e.g., related to machine learning, cloud, big data, blockchain, IoT; constraints such as e.g., impact on the organisation/ business/ society; the development environment, programming language, technology, requirements related to performance, security, accessibility, usability, privacy, ethics, safety, IS policy, cost, quality)

1.2.1.1 Duration of Study

Recommended duration: starting from 2 ECTS

Often integrated with studies of PLOs:

1.2.1.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the advanced studies for students with prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling developers.

1.2.1.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.2.1.4 WBL and Follow-up Reinforcement

After learning the basic principles, terminology, and models of software design, the study should focus on analysing and simulating real work-life-like tasks as, for example:

- Implementation of Business/Industry Projects
- Industry practitioner - led session

1.2.1.5 Important (new) approaches and technologies to consider

n/a

1.2.1.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)

Assesses needs of customers, users, and stakeholders and formulates requirements and functional specifications, taking into account overall business needs (e.g., by performing a requirements analysis)	Practical assignment, exam	Assessment (of skills)
Specifies a design for an advanced/ innovative solution, software application or component, taking into account specific constraints/ requirements	Practical assignment, exam	Assessment (of skills)

1.2.2 Learning Resources - PLO 1. Application Design [e-4]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Databases	7	2,5 ECTS	Blended	Practical assignment exam	Fundamentals and design of relational databases SQL Queries	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_Fundamentals-and-design-of-relational-databases-Data-modeling-techniques.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_Fundamentals-and-design-of-relational-databases-Physical-elements-of-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_Fundamentals-and-design-of-relational-databases-Normalizing-the-data-model.pptx
Database management systems administration	7	3 ECTS	Blended	Practical assignment exam	Azure DB	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_AzureDB_ENG.pptx
Data encryption and security	7	2 ECTS	Blended	Practical assignment exam	T-SQL language with cryptography elements Database administration	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_Fundamentals-and-design-of-relational-databases-Data-modeling-techniques.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_Fundamentals-and-design-of-relational-databases-Physical-elements-of-the-data-model.pptx

						https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_Fundamentals-and-design-of-relational-databases-Normalizing-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN04_T-SQL-language-with-cryptography-elements-User-defined-functions.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN05_T-SQL-language-with-cryptography-elements-Stored-procedures.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN06_T-SQL-language-with-cryptography-elements-Triggers.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN07_T-SQL-language-with-cryptography-elements-Transactions.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN08_T-SQL-language-with-cryptography-elements-Exception-handling.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN09_T-SQL-language-with-cryptography-elements-Distributed-processing-Service-Broker.pptx

							https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN10_T-SQL-language-with-cryptography-elements-CLR-functions-and-procedures.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN11_T-SQL-language-with-cryptography-elements-Encryption-and-decryption-in-SQL-Server.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_AdministeringDataBases_Eng.pptx
Data mining	7	3,5 ECTS	Blended	Practical assignment exam	Statistical basis of data processing Data processing and visualization with Python language	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-LSM2.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Nominal8.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-PCA3.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Stat1.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Text7.pdf

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						https://learn.softwareskills.eu/wp-content/uploads/2024/01/5-Clustering-presentation.pdf

1.2.3 PLO 2. Application Development [e-4]

2. PLO Application Development [e-4]	
The learner has demonstrated capability *→ to creatively develop and validate an advanced/ innovative solution, software application or component*	
Unit learning outcomes	Writes complex code and related documentation to it, taking into account relevant principles and constraints
	Creates an advanced/ innovative working software component or application, that satisfies its requirements, applying complex techniques and tools (e.g., embedded software, cloud-based applications; related to e.g., machine learning, cloud, big data, blockchain, IoT)

1.2.3.1 Duration of Study

Recommended duration: starting from 2 ECTS

Often integrated with studies of PLOs:

1.2.3.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the advanced studies for students with prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling developers.

1.2.3.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.2.3.4 WBL and Follow-up Reinforcement

n/a

1.2.3.5 Important (new) approaches and technologies to consider

n/a

1.2.3.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Writes complex code and related documentation to it, taking into account relevant principles and constraints	Practical assignment, exam	Assessment (of skills)
Creates an advanced/ innovative working software component or application, that satisfies its requirements, applying complex techniques and tools	Practical assignment, exam	Assessment (of skills)

1.2.4 Learning Resources - PLO 2. Application Development [e-4]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Databases	7	2,5 ECTS	Blended	Practical assignment exam	Fundamentals and design of relational databases SQL Queries	Lecture, practical assignment	https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_Fundamentals-and-design-of-relational-databases-Normalizing-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_SQLQueries-Nr-1.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_SQLQueries-Examples-of-databases-No-2.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_SQLQueries-Simple-queries-No3.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_SQLQueries-Grouping-and-aggregating-data-No-4.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_SQLQueries-CTE-expressions-No-5.pptx

Data encryption and security	7	2 ECTS	Blended	Practical assignment exam	T-SQL language with cryptography elements Database administration	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_T-SQL-language-with-cryptography-elements-Variables-temporary-tables-and-table-variables-2.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_T-SQL-language-with-cryptography-elements-Cursors-2.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_T-SQL-language-with-cryptography-elements-Dynamic-SQL-2.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN04_T-SQL-language-with-cryptography-elements-User-defined-functions-2.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN05_T-SQL-language-with-cryptography-elements-Stored-procedures-2.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN06_T-SQL-language-with-cryptography-elements-Triggers-1.pptx

							https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN07_T-SQL-language-with-cryptography-elements-Transactions-1.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN08_T-SQL-language-with-cryptography-elements-Exception-handling-1.pptx
Object-relational mapping	7	3 ECTS	Blended	Practical assignment exam	An introduction to ORM Advanced ORM tools and techniques	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_00.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_01-Entity-Framework-Introduction.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_02-Entity-Data-Model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_04-Creating-updating-deleting-entities.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_05-Multi-User-scenarios.pptx

							https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_05-Multi-User-scenarios.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_03-Queries.pptx
Data mining	7	3,5 ECTS	Blended	Practical assignment	Statistical basis of data processing Data processing and visualization with Python language	Lecture/project	Statistical basics of data processing https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_T-SQL-language-with-cryptography-elements-Variables-temporary-tables-and-table-variables-3.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN11_T-SQL-language-with-cryptography-elements-Encryption-and-decryption-in-SQL-Server-3.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN10_T-SQL-language-with-cryptography-elements-CLR-functions-and-procedures-3.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN09_T-SQL-

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						language-with-cryptography-elements-Dynamic-SQL-3.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_T-SQL-language-with-cryptography-elements-Cursors-3.pptx Data processing and visualizatio with Python language https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Complex-data-types-Nr-3-class-list.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Complex-data-types-Nr-2-klasa-str.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Variables-and-simple-data-types-No-1.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Data-visualisation-with-matplotlib-Nr-5.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Complex-data-types-Nr-4-class-tuple.pptx

1.2.5 PLO 3. Component Integration [e-4]

3. PLO Component Integration [e-4]	
The learner has demonstrated capability *→ to provide expert guidance or advice on integration of an advanced/ innovative solution, software application or component*	
Unit learning outcomes	Creates and guides a process for integration of an advanced/ innovative solution, software application or component (e.g., proposes standards of practice; for a solution related to e.g., machine learning, cloud, big data, blockchain, IoT)
	Writes a report/ advisory report/ paper/ research article on integration of a solution or software application in an innovative/ advanced/ complex situation (e.g., an analysis of software integration challenges related to a particular technology or method, a process/HR/internal standards design for an integration cycle, a resource assignment plan)

1.2.5.1 Duration of Study

Recommended duration: starting from 2 ECTS

Often integrated with studies of PLOs:

1.2.5.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling junior developers.

1.2.5.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.2.5.4 WBL and Follow-up Reinforcement

n/a

1.2.5.5 Important (new) approaches and technologies to consider

n/a

1.2.5.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Creates and guides a process for integration of an advanced/ innovative solution, software application or component (e.g., proposes standards of practice; for a solution related to e.g., machine learning, cloud, big data, blockchain, IoT)	Practical assignment, exam	Assessment (of skills)
Writes a report/ advisory report/ paper/ research article on integration of a solution or software application in an innovative/ advanced/ complex situation	Practical assignment, exam	Assessment (of skills)

1.2.6 Learning Resources - PLO 3. Component Integration [e-4]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Data encryption and security	7	2 ECTS	Blended	Practical assignment exam	T-SQL language with cryptography elements Database administration	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_Fundamentals-and-design-of-relational-databases-Data-modeling-techniques.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_Fundamentals-and-design-of-relational-databases-Physical-elements-of-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_Fundamentals-and-design-of-relational-databases-Normalizing-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN04_T-SQL-language-with-cryptography-elements-User-defined-functions.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN05_T-SQL-language-with-cryptography-elements-Stored-procedures.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN06_T-SQL-language-with-cryptography-elements-Triggers.pptx

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Object-relational mapping	7	3 ECTS	Blended	Practical assignment exam	An introduction to ORM Advanced ORM tools and techniques	Lecture/project	AN INTRODUCTION TO ORM https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_An-introduction-to-ORM-What-is-object-relational-mapping.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_An-introduction-to-ORM-Connecting-to-the-database.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_An-introduction-to-ORM-ORM-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN04_An-introduction-to-ORM-CRUD-operations.pptx ADVANCED ORM TOOLS AND TECHNIQUES https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_00.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_01-Entity-Framework-Introduction.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_EF_EN_01-Entity-Framework-Introduction.pptx

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1.2.7 PLO 4. Testing [e-4]

4. PLO Testing [e-4]	
The learner has demonstrated capability *→ to provide expert guidance or advice on testing an advanced/ innovative solution, software application or component*	
Unit learning outcomes	Creates and guides a process for testing an advanced/ innovative solution, software application or component (e.g., proposes standards of practice; for a solution related to e.g., machine learning, cloud, big data, blockchain, IoT)
	Writes a report/ advisory report/ paper/ research article on a topic related to testing of an innovative/ advanced/ complex solution, software application or component or on issues regarding testing in specific situations (e.g., agile testing, a process design for an entire testing activity, specification of internal standards of practice for testing, test management plan for CI testing)

1.2.7.1 Duration of Study

Recommended duration: starting from 2 ECTS

Often integrated with studies of PLOs:

1.2.7.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling developers.

1.2.7.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20+%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.2.7.4 WBL and Follow-up Reinforcement

n/a

1.2.7.5 Important (new) approaches and technologies to consider

n/a

1.2.7.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Creates and guides a process for testing an advanced/ innovative solution, software application or component (e.g., proposes standards of practice; for a solution related to e.g., machine learning, cloud, big data, blockchain, IoT)	Practical assignment exam	Assessment (of skills)
Writes a report/ advisory report/ paper/ research article on a topic related to testing of an innovative/ advanced/ complex solution, software application or component or on issues regarding testing in specific situations (e.g., agile testing, a process design for an entire testing activity, specification of internal standards of practice for testing, test management plan for CI testing)	Practical assignment exam	Assessment (of skills)

1.2.8 Learning Resources - PLO 4. Testing [e-4]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Database management systems administration	7	3 ECTS	Blended	Practical assignment exam	NoSQL systems Azure DB	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_NOSQL_ENG.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_AzureDB_ENG.pptx Azure DB https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_AzureDB_ENG.pptx
Data encryption and security	7	2 ECTS	Blended	Practical assignment exam	T-SQL language with cryptography elements Database administration	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_Fundamentals-and-design-of-relational-databases-Data-modeling-techniques.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_Fundamentals-and-design-of-relational-databases-Physical-elements-of-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_Fundamentals-and-design-of-relational-databases-Normalizing-the-data-model.pptx

						https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN04_T-SQL-language-with-cryptography-elements-User-defined-functions.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN05_T-SQL-language-with-cryptography-elements-Stored-procedures.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN06_T-SQL-language-with-cryptography-elements-Triggers.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN07_T-SQL-language-with-cryptography-elements-Transactions.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN08_T-SQL-language-with-cryptography-elements-Exception-handling.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN09_T-SQL-language-with-cryptography-elements-Distributed-processing-Service-Broker.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN10_T-SQL-language-with-cryptography-elements-CLR-functions-and-procedures.pptx

							https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN11_T-SQL-language-with-cryptography-elements-Encryption-and-decryption-in-SQL-Server.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_AdministeringDataBases_Eng.pptx
Object-relational mapping	7	3 ECTS	Blended	Practical assignment exam	An introduction to ORM Advanced ORM tools and techniques	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-LSM2.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Nominal8.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-PCA3.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Stat1.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Text7.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Classification6.pdf

						https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Clustering5.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-FA4.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/6-Classification-Algorithms-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/7-Text-Mining-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/8-Nominal-Data-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/2-Least-Squares-Method-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/3-Principal-Component-Analysis-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/4-Factor-Analysis-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/5-Clustering-presentation.pdf

1.2.9 PLO 5. Profession related competences [EQF7]

5. PLO Profession related competences [EQF7]	
The learner has demonstrated capability *→ to apply profession related skills*	
Unit learning outcomes	Advises on the application of a new technology. Given a certain situation or context, writes a report with recommendations or an advice on a solution that involves the application of a new technology. Reflects critically on a new technology.
	Analyses, improves, and provides expert advice and guidance on security standards, regulations, measures, methods, tools, and techniques, taking into account the broader business context and current IT developments
	Analyses, improves, and provides expert advice and guidance on sustainability standards, regulations, measures, and methods, taking into account the broader business context and current IT developments
	Is continuously aware of ethical considerations and issues and applies these in professional context and activities. Forms and communicates an opinion based on incomplete and or limited information, taking into account social, scientific and ethical responsibilities related to the application of own knowledge and opinions. Promotes ethical thinking

1.2.9.1 Duration of Study

Recommended duration: starting from 1 ECTS

Often integrated with studies of PLOs:

1.2.9.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling developers.

1.2.9.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80%
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.2.9.4 WBL and Follow-up Reinforcement

n/a

1.2.9.5 Important (new) approaches and technologies to consider

n/a

1.2.9.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Advises on the application of a new technology. Given a certain situation or context, writes a report with recommendations or an advice on a solution that involves the application of a new technology. Reflects critically on a new technology.	Practical assignment	Assessment (of skills)
Analyses, improves, and provides expert advice and guidance on security standards, regulations, measures, methods, tools, and techniques, taking into account the broader business context and current IT developments	Practical assignment	Assessment (of skills)
Analyses, improves, and provides expert advice and guidance on sustainability standards, regulations, measures, and methods, taking into account the broader business context and current IT developments	Practical assignment	Assessment (of skills)
Is continuously aware of ethical considerations and issues and applies these in professional context and activities. Forms and communicates an opinion based on incomplete and or limited information, taking into account social, scientific and ethical responsibilities related to the application of own knowledge and opinions. Promotes ethical thinking	Practical assignment	Assessment (of skills)

1.2.10 Learning Resources - PLO 5. Profession related competences [EQF7]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Fundamentals of Law for IT	7	1 ECTS	Blended	Practical assignment exam	*Fundamentals of Law for IT*	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-Poland-outline-of-the-lecture-part-III-en.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-Poland-outline-of-the-lecture-part-II-en.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-Poland-outline-of-the-lecture-part-I-en.pptx
Data encryption and security	7	2 ECTS	Blended	Practical assignment	T-SQL language with cryptography elements Database administration	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_Fundamentals-and-design-of-relational-databases-Data-modeling-techniques.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_Fundamentals-and-design-of-relational-databases-Physical-elements-of-the-data-model.pptx

						https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_Fundamentals-and-design-of-relational-databases-Normalizing-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN04_T-SQL-language-with-cryptography-elements-User-defined-functions.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN05_T-SQL-language-with-cryptography-elements-Stored-procedures.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN06_T-SQL-language-with-cryptography-elements-Triggers.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN07_T-SQL-language-with-cryptography-elements-Transactions.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN08_T-SQL-language-with-cryptography-elements-Exception-handling.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN09_T-SQL-language-with-cryptography-elements-Distributed-processing-Service-Broker.pptx

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							https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-LSM2.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Nominal8.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-PCA3.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Stat1.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Text7.pdf

						https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Classification6.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Clustering5.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-FA4.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/6-Classification-Algorithms-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/7-Text-Mining-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/8-Nominal-Data-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/2-Least-Squares-Method-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/3-Principal-Component-Analysis-presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/4-Factor-Analysis-presentation.pdf

						https://learn.softwareskills.eu/wp-content/uploads/2024/01/5-Clustering-presentation.pdf

1.2.11 PLO 6. Soft competences [EQF7]

6. PLO Soft competences [EQF7]	
The learner has demonstrated capability *→ to apply soft skills*	
Unit learning outcomes	Related to the occupation, knowledge domain, and field of science, critically collects: in-depth and detailed professional and scientific information on a range of basic theories, principles and concepts, as well as information on some important current issues and topics. Analyses, evaluates, and combines critically this information, knowledge and insights and presents this in a scientific way. Critically applies/ translates/ interprets results of research (possibly executed by others) to the own context (the occupation and/or knowledge domain). Executes detailed scientific research
	Exercises (self-)management in situations that are complex, unpredictable and require new strategic approaches. Is able to cope with change (positive or negative), to adapt to a considerable level of variety in the workplace and to transform the work or study context. Handles pressure and setbacks and maintains composure. Shows initiative, creativity and originality and carries responsibility for the results of own activities, work and or study and for the work results of others. Works correctly and carefully, fully aware of the importance of trustworthiness and accountability.
	Realises learning and personal development, mostly autonomous and based on intrinsic motivation, looking for personal learning objectives. Selects and uses training/instructional methods and procedures appropriate for the situation when learning or teaching new things.

1.2.11.1 Duration of Study

Recommended duration: starting from 1 ECTS

Often integrated with studies of PLOs:

1.2.11.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling junior developers.

1.2.11.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

n/a

Recommended delivery methods:

• Lecture	☒ up to 80 %
• Case study. Individual/team project	☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.2.11.4 WBL and Follow-up Reinforcement

n/a

1.2.11.5 Important (new) approaches and technologies to consider

n/a

1.2.11.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Related to the occupation, knowledge domain, and field of science, critically collects: in-depth and detailed professional and scientific information on a range of basic theories, principles and concepts, as well as information on some important current issues and topics. Analyses, evaluates, and combines critically this information, knowledge and insights and presents this in a scientific way. Critically applies/ translates/ interprets results of research (possibly executed by others) to the own context (the occupation and/or knowledge domain). Executes detailed scientific research	Practical assignment	Assessment (of skills)
Exercises (self-)management in situations that are complex, unpredictable and require new strategic approaches. Is able to cope with change (positive or negative), to adapt to a considerable level of variety in the workplace and to transform the work or study context.	Practical assignment	Assessment (of skills)

Handles pressure and setbacks and maintains composure.		
Shows initiative, creativity and originality and carries responsibility for the results of own activities, work and or study and for the work results of others.	Practical assignment	Assessment (of skills)

1.2.12 Learning Resources - PLO 6. Soft competences [EQF7]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Fundamentals of Agile Team Management	7	1 ECTS	Blended	Practical assignment	*Fundamentals of Agile Team Management*	Lecture, practical assignment	https://learn.softwareskills.eu/wp-content/uploads/2024/01/Fundamentals_of_Agile_Team_Management_presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/Fundamental_of_Agile_Team_Management_exercises.pdf
Fundamentals of Law for IT	7	1 ECTS	Blended	Practical assignment	Fundamentals of Law for IT	Lecture	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-Poland-outline-of-the-lecture-part-III-en.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-

							Poland-outline-of-the-lecture-part-II-en.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-Poland-outline-of-the-lecture-part-I-en.pptx
Diploma thesis design	7	5 ECTS	Blended	Diploma exam	Diploma thesis design	Lecture, practical assignment	-

1.2.13 PLO 7. Functioning in organisation [EQF7]

7. PLO Functioning in organisations [EQF7]	
The learner has demonstrated capability *→ to function in an organisational context*	
Unit learning outcomes	Explains organisation theory and behaviour
	Describes the relationship between business and IT
	Works in an organisational context under broad direction, performing coordinating activities, with at least 3 years of working experience at an intermediate or senior level, as e.g., a specialist, team leader, manager, or a comparable role
	Leads a project
	Writes a report on functioning in organisation

1.2.13.1 Duration of Study

Recommended duration: starting from 1 ECTS

Often integrated with studies of PLOs:

1.2.13.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling developers.

1.2.13.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

n/a

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.2.13.4 WBL and Follow-up Reinforcement

n/a

1.2.13.5 Important (new) approaches and technologies to consider

n/a

1.2.13.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Explains organisation theory and behaviour	Practical assignment	Assessment (of skills)
Describes the relationship between business and IT	Practical assignment	Assessment (of skills)
Works in an organisational context under broad direction, performing coordinating activities, with at least 3 years of working experience at an intermediate or senior level, as e.g., a specialist, team leader, manager, or a comparable role	Practical assignment	Assessment (of skills)
Leads a project	Practical assignment	Assessment (of skills)
Writes a report on functioning in organisation	Practical assignment	Assessment (of skills)

1.2.14 Learning Resources - PLO 7. Functioning in organisation [EQF7]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Fundamentals of Agile Team Management	7	1 ECTS	Blended	Practical assignment, report	*Fundamentals of Agile Team Management*	Lecture, practical assignment	https://learn.softwareskills.eu/wp-content/uploads/2024/01/Fundamentals_of_Agile_Team_Management_presentation.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/Fundamental_of_Agile_Team_Management_exercises.pdf
Fundamentals of Law for IT	7	1 ECTS	Blended	Practical assignment	*Fundamentals of Law for IT*	Lecture	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-Poland-outline-of-the-lecture-part-III-en.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-Poland-outline-of-the-lecture-part-II-en.pptx

						https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Fundamentals-of-Law-for-IT-in-Poland-outline-of-the-lecture-part-I-en.pptx

1.2.15 EXTRA CURRICULAR PLO: New Technology [EQF7]

PLO New Technology [EQF7]	
Unit learning outcomes	Given a certain situation or context, writes a report with recommendations or an advice on a solution that involves the application of (a method, technique or tool related to) a new technology, considering specific issues related to this technology (e.g., impact on the organisation/ business/ society; security, ethical issues)
	Writes a critical reflection on a new technology

1.2.15.1 Duration of Study

Recommended duration: starting from 2,5 ECTS

Often integrated with studies of PLOs:

1.2.15.2 Recommendations for Micro-credentials

- This PLO should be an integral part of the initial studies for students with no prior knowledge of software development.
- Recommended as an independent micro-credential for upskilling junior developers.

1.2.15.3 Recommendations on Didactical Approach, Delivery Methods and Training Environment

Recommended didactical approach:

- Presence Classroom ☒
- Virtual Classroom ☒
- Blended ☒

Additional comments

Recommended delivery methods:

- Lecture ☒ up to 80 %
- Case study. Individual/team project ☒ 20 +%

Additional comments

Lectures, e-learning are recommended for learning the basic principles, terminology, and models of software design. These should be reinforced through practical tasks, case studies, individual/team-projects.

1.2.15.4 WBL and Follow-up Reinforcement

n/a

1.2.15.5 Important (new) approaches and technologies to consider

n/a

1.2.15.6 Assessment

Unit learning outcome	Assessment method	Validation of prior acquired competences (skills and knowledge)
Given a certain situation or context, writes a report with recommendations or an advice on a solution that involves the application of (a method, technique or tool related to) a new technology, considering specific issues related to this technology (e.g., impact on the organisation/ business/ society; security, ethical issues)	Practical assignment	Assessment (of skills)

1.2.16 Learning Resources - EXTRA CURRICULAR PLO: New Technology [EQF7]

LEARNING UNIT	EQF	Duration	Didactical Approach	ASSESSMENT	Title of the Learning material	Delivery method of the learning material	Quick link to learning materials
Databases	7	2,5 ECTS	Blended	Practical assignment exam	Fundamentals and design of relational databases SQL Queries	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN01_Fundamentals-and-design-of-relational-databases-Data-modeling-techniques.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN02_Fundamentals-and-design-of-relational-databases-Physical-elements-of-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/EN03_Fundamentals-and-design-of-relational-databases-Normalizing-the-data-model.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_SQLQueries-Examples-of-databases-No-2.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_SQLQueries-Simple-queries-No3.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_SQLQueries-Grouping-and-aggregating-data-No-4.pptx

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Data mining	7	3,5 ECTS	Blended	Practical assignment	Statistical basis of data processing Data processing and visualization with Python language	Lecture/project	https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-LSM2.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Nominal8.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-PCA3.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Text7.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Classification6.pdf

							https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-Clustering5.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Learning-Programmes-and-Materials-EQF-7_DMWSCS-FA4.pdf https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Complex-data-types-Nr-3-class-list.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Complex-data-types-Nr-2-klasa-str.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Variables-and-simple-data-types-No-1.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Data-visualisation-with-matplotlib-Nr-5.pptx https://learn.softwareskills.eu/wp-content/uploads/2024/01/ESSA_Python-Complex-data-types-Nr-4-class-tuple.pptx

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Co-funded by the
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