**European Masters Programme in Software Engineering (EMSE)**

**Academic Programme**

**2016-2018 onwards**

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| The academic programme lasts two years and is divided in 4 semesters. |
| It develops along *learning paths* which foresee students to attend one year (60 ECTS) at each of two universities of the Consotium. |
| At the submissio, candidates must choose a learning path |
| There are 12 learning paths: |
| |  |  |  | | --- | --- | --- | |  | **1° anno – 1. Jahr** | **2°anno – 2. Jahr** | | 1 | unibz | UNIKL | | 2 | unibz | UPM | | 3 | unibz | OY | | 4 | UNIKL | unibz | | 5 | UPM | unibz | | 6 | OY | unibz | | 7 | UNIKL | OY | | 8 | UNIKL | UPM | | 9 | OY | UNIKL | | 10 | OY | UPM | | 11 | UPM | OY | | 12 | UPM | UNIKL | |
| The study currculum is compounded of the modules Foundations, Advanced Topics in Software Engineering, Transversal Skills, Free Choice, Internship and Thesis according to the following schema, which also illustrate the range of credits for each module and their temporal distribution |
| |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **1st Year** | | | **2nd Year** | | | | | | **1st semester** | **2nd semester** | | **3rd semester** | | | **4th semester** | | | **Foundations** | | | **Internship** | 8-14 CP | | **Thesis** | 30CP | | Verification and Validation (EMSE -VV) | | 8-12 CP |  | | |  | | | Empirical Software Engineering Research (EMSE - ESER) | | 8-10 CP | | Software Process and Project Management (EMSE - SPPM) | | 8-16 CP | | Requirements and Design of Software Systems (EMSE - RDSS) | | 8-14 CP | | **Advanced Topics in Software Engineering** | | | | | 8-18 CP | | **Transversal Skills** | | | | | 12-16 CP | | **Free Choice** | | | | | 12 CP | |
| The courses that belogn to the module “Foundations”, are:   * Software Process and Project Management (EMSE – SPPM) * Requirements and Design of Software Systems (EMSE – RDSS) * Verification and Validation (EMSE - VV) * Empirical Software Engineering Research (ESEM – ESER)   Each course is compulsory and has 8 ECTS as mimimum number of credits in all the possible learning paths. |
| The courses under the module “Advanced Topic in Software Engineeringhave no less than 8 ECTS.  . |
| The courses under the “Transversal Skills” module are distributed along three semsters. |
| The Internship has at least 8 ECTS. |
| The fourth semster is dedicated to the work (30 CFU). |

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| Learning paths | | |
| Learning path: unibz-OY |  |
| |  |  |  | | --- | --- | --- | | **First year unibz** | | | | **Courses** | **ECTS** | **Exam** | | **Annual Courses** | | | | Software Process and Project Management (EMSE-SPPM) | 16 | yes | | **1° semester** | | | | Requirements and Design of Software Systems (EMSE-RDSS) | 8 | yes | | Advanced Statistics for Data Mining | 12 | Pass/Fail | | **2° semester** | | | | Verification and Validation (EMSE-VV) | 8 | yes | | Empirical Software Engineering Research(EMSE-ESER) | 8 | yes | | Advanced Topic in Software Engineering (EMSE-ATSE) | 8 | yes | | **Total** | **60** |  | | |
| |  |  |  | | --- | --- | --- | | **Second year OY** | | | | **Courses** | **ECTS** | **Exam** | | **1° semester** | | | | Internship (EMSE –Int) | 14 | Pass/Fail | | Interaction Design (EMSE – TS) | 4 | Pass/Fail | | Free Choice | 12 | yes | | **2° semester** | | | | Thesis | 30 |  | | **Total** | **60** |  | | |

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| Learning path: unibz-UKL |  |
| |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **First year unibz** | | | | | | | | | **Courses** | | | **ECTS** | | **Exam** | | | | **Annual Courses** | | | | | | | | | Software Process and Project Management (EMSE-SPPM) | | | 16 | | yes | | | | **1° semester** | | | | | | | | | Requirements and Design of Software Systems (EMSE-RDSS) | | | 8 | | yes | | | | Advanced Statistics for Data Mining | | | 12 | | Pass/fail | | | | **2° semester** | | | | | | | | | Verification and Validation (EMSE-VV) | | | 8 | | yes | | | | Empirical Software Engineering Research (EMSE-ESER) | | | 8 | | yes | | | | Advanced Topic in Software Engineering (EMSE-ATSE) | | | 8 | | yes | | | | **Total** | | | **60** | |  | | | | **Second year UNIKL** | | | | | | | | | **Courses** | **ECTS UKL** | **Esame/ Prüfung** | | **SSD** | | | **Tipo/Art** | | **1° semester** | | | | | | | | | Internship (EMSE –Int) | | | 8 | | | Pass/fail | | | Advanced Topic in Software Engineering (EMSE -ATSE) | | | 6 | | | yes | | | Grid and Cloud Computing (EMSE – TS) | | | 4 | | | Pass/fail | | | Free Choice | | | 12 | | | yes | | | **2° semester** | | | | | | | | | Thesis | | | 30 | | |  | | | **Total** | | | **60** | | |  | | | |

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| Learning path: unibz-UPM |  |
| |  |  |  | | --- | --- | --- | | **First year unibz** | | | | **Courses** | **ECTS** | **Exam** | | **Annual Courses** | | | | Software Process and Project Management  (EMSE-SPPM) | 16 | yes | | **1° semester** | | | | Requirements and Design of Software Systems (EMSE-RDSS) | 8 | yes | | Advanced Statistics for Data Mining | 12 | Pass/fail | | **2° semester** | | | | Verification and Validation (EMSE-VV) | 8 | yes | | Empirical Software Engineering Research (EMSE-ESER) | 8 | yes | | Advanced Topic in Software Engineering (EMSE-ATSE) | 8 | yes | | **Total** | **60** |  | | **Second year UPM** | | | | **Courses** | **ECTS** | **Exam** | | **1° semester** | | | | Internship (EMSE –Int) | 14 | Pass/fail | | Management, Relationships and Communication in Working Groups (EMSE-TS) | 4 | Pass/fail | | Free Choice | 12 | yes | | **2° semester** | | | | Thesis | 30 |  | | **Total** | **60** |  | | |

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| Learning path: OY-unibz |  |
| |  |  |  | | --- | --- | --- | | **First year OY** | | | | **Courses** | **ECTS** | **Exam** | | **Annual Courses** | | | | Verification and Validation (EMSE-VV) | 10 | yes | | Requirements and Design of Software Systems (EMSE-RDSS) | 11 | yes | | **1° semester** | | | | Software Process and Project Management (EMSE- SPPM) | 10 | yes | | Empirical Software Engineering Research (EMSE-ESER) | 9 | yes | | **2° semester** | | | | Advanced Topic in Software Engineering (EMSE- ATSE) | 10 | yes | | IT Infrastructure (EMSE-TS) | 5 | Pass/fail | | Mobile and Social Computing (EMSE-TS) | 5 | Pass/fail | | **Total** | **60** |  | | **Second year unibz** | | | | **Courses** | **ECTS** | **Exam** | | **1° semester** | | | | Internship (EMSE –Int) | 8 | Pass/fail | | Advanced Topic in Software Engineering (EMSE- ATSE) | 8 | yes | | Research Methods (EMSE-TS) | 2 | Pass/fail | | Free Choice | 12 | yes | | **2° semester** | | | | Thesis | 30 |  | | **Total** | **60** |  | | |

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| Learning path: UKL-unibz |  |
| |  |  |  |  | | --- | --- | --- | --- | | **First year UKL** | | | | | **Courses** | **ECTS** | **Exam** | | | **Annual Courses** | | | | | Verification and Validation (EMSE-VV) | 12 | yes | | | Requirements and Design of Software Systems (EMSE-RDSS) | 12 | yes | | | **1° semester** | | | | | Advanced Topic in Software Engineering (EMSE- ATSE-I) | 8 | yes | | | Performance Modeling of Distributed Systems (EMSE-TS) | 4 | Pass/fail | | | Product Line Engineering (EMSE-TS) | 4 | Pass/fail | | | **2° semester** | | | | | Software Process and Project Management (EMSE-SPPM) | 8 | yes | | Empirical Software Engineering Research (EMSE-ESER) | 8 | yes | | Process Modeling (EMSE-TS) | 4 | Pass/fail | | **Total** | **60** |  |  |  |  |  | | --- | --- | --- | | **Second year unibz** | | | | **Courses** | **ECTS** | **Exam** | | | **1° semester** | | | | | Internship (EMSE –Int) | 8 | Pass/fail | | | Advanced Topic in Software Engineering (EMSE- ATSE) | 8 | yes | | | Research Methods (EMSE-TS) | 2 | Pass/fail | | | Free Choice | 12 | yes | | | **2° semester** | | | | | Thesis | 30 |  | | | **Total** | **60** |  | | | |

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| Learning path: UPM-unibz |  |
| |  |  |  | | --- | --- | --- | | **First year UPM** | | | | **Courses** | **ECTS** | **Exam** | | **Annual Courses** | | | | Verification and Validation (EMSE-VV) | 10 | yes | | Requirements and Design of Software Systems (EMSE-RDSS) | 14 | yes | | Empirical Software Engineering Research (EMSE-ESER) | 10 | yes | | **1° semester** | | | | Software Process and Project Management (EMSE-SPPM) | 8 | yes | | Critical Software (EMSE-TS) | 3 | Pass/fail | | Software Engineering Economics (EMSE-TS) | 3 | Pass/fail | | **2° semester** | | | | Advanced Topic in Software Engineering (EMSE- ATSE) | 6 | yes | | Interaction Design (EMSE-TS) | 6 | Pass/fail | | **Total** | **60** |  |  |  |  |  | | --- | --- | --- | | **Second year unibz** | | | | **Courses** | **ECTS** | **Exam** | | **1° semester** | | | | Internship (EMSE –Int) | 8 | Pass/fail | | Advanced Topic in Software Engineering (EMSE- ATSE) | 8 | yes | | Research Methods (EMSE-TS) | 2 | Pass/fail | | Free Choice | 12 | yes | | **2° semester** | | | | Thesis | 30 |  | | **Total** | **60** |  | | |

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| General syllabus of “Foundations” |
| **Software Process and Project Management (EMSE – SPPM)** |
| Building the capacity and ability to define, manage and improve software process and project are the main focus of this topic. The course includes techniques and methods for managing the process of development and coordinating project artefacts in all its stages. The students will also be introduced to techniques of decision-making for software processes. |
| **Requirements and Design of Software Systems (EMSE – RESD)** |
| Students will acquire skills and competencies resulting from the conception, negotiation, documentation and maintenance of software requirements in a specific domain and environment. Requirements analysis aims at reviewing, assessing, prioritizing, and balancing the software requirements by developing technical specifications for building a system that will meet the needs of the stakeholders. Design of software systems aims at identifying or building software components that define the characteristics and quality of a system. The students are exposed to problem-solving techniques that allow the synthesis of software solutions satisfying the requirements of the system. |
| **Verification and Validation (EMSE -VV)** |
| The topic defines the principles and practices of verification and validation of software systems. Verification methods aims at checking that the elements of the system meet prescribed software specification. In other words, the system must be built right. The verification process also aims to define and apply any procedures and actions to restore compliance with the requirements. The validation aims at assessing whether the implemented system meets the requirements / needs of stakeholders. In other words, the system must be the right one. |
| **Empirical Software Engineering Research (EMSE - ESER)** |
| This topic defines the paradigms, methods, and techniques of scientific investigation in software engineering. Students learn how to conduct experiments, surveys and studies in real environments as well as how to mine, measure, and analyse data and software artefacts. |

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| Advanced Topic in Software Engineering (EMSE – ATSE) | |
| Students can choose from the following list: |  |
| |  |  |  | | --- | --- | --- | | **Insegnamenti/ Lehrveranstaltung** | **CFU/ KP** | **Ateneo / Universität** | | Advances in Software Engineering | 10 | OY | | Advances in Software Systems | 10 | OY | | Advanced Project Management | 6 | UKL | | Advances in Software Engineering | 6 | UKL | | Advances in Requirement Engineering | 8 | UKL | | Applied Automata Theory | 8 | UKL | | Middleware for Heterogeneous and Distributed Information Systems | 8 | UKL | | Software Quality | 8 | UKL | | Advanced Internet Technologies | 8 | unibz | | Advanced Programming Techniques for Software Engineering | 8 | unibz | | IT and service management | 8 | unibz | | Lean start up | 8 | unibz | | Advances in Software Engineering | 6 | UPM | | Agent Based Software Engineering | 6 | UPM | | |

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| Transversal Skills (EMSE-TS) |  |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Insegnamento/ Lehrveranstaltung** | **CFU/ KP** | **Semestre/**  **Semester** | **Esame/ Prüfung** | **Ateneo/ Universität** | | Interaction Design | 4 | 3 | Idoneità/ Eignung | OY | | IT Infrastructure | 5 | 2 | Sì/Ja | OY | | Mobile and Social Computing | 5 | 2 | Sì/Ja | OY | | Performance Modeling of Distributed Systems | 4 | 1 | Idoneità/ Eignung | UKL | | Process Modeling | 4 | 2 | Sì/Ja | UKL | | Product Line Engineering | 4 | 1 | Sì/Ja | UKL | | Grid and Cloud Computing | 4 | 3 | Sì/Ja | UKL | | Advanced Statistics for Data Mining | 12 | 1 | Idoneità/ Eignung | unibz | | Research Methods | 2 | 3 | Idoneità/ Eignung | unibz | | Critical Software | 3 | 1 | Sì/Ja | UPM | | Software Engineering Economics | 3 | 1 | Sì/Ja | UPM | | Interaction Design | 6 | 2 | Idoneità/ Eignung | UPM | | Management, Relationships and Communication in Working Groups | 4 | 3 | Idoneità/ Eignung | UPM | | |
| Free Choice | |
| Students can choose 12 ECTS from the following list of courses. | |
| Any other course proposed by the student must be approved by the Joint Board. | |

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| Allegato A **Elenco degli insegnamenti suggeriti per la categoria a libera scelta (Free Choice)** | Anlage A **Verzeichnis der zur Verfügung stehenden Wahlfächer (Free Choice)** |
| |  |  |  | | --- | --- | --- | | **Insegnamento / Lehrveranstaltung** |  |  | | Advances in Software Engineering | 10 | OY | | Advances in Software Systems | 10 | OY | | Interaction Design | 4 | OY | | IT Infrastructure | 5 | OY | | Mobile and Social Computing | 5 | OY | | Research Methods | 5 | OY | | Software Engineering Research | 7 | OY | | Advanced Project Management | 6 | UKL | | Advances in Requirement Engineering | 8 | UKL | | Advances in Software Engineering | 6 | UKL | | Applied Automata Theory | 8 | UKL | | Automotive Software Engineering | 8 | UKL | | Concurrency Theory | 8 | UKL | | Empirical Model Building and Methods | 4 | UKL | | Grid and Cloud Computing | 4 | UKL | | Interaction Design | 6 | UKL | | Middleware for Heterogeneous and Distributed Information Systems | 8 | UKL | | Performance Modeling of Distributed Systems | 4 | UKL | | Process Modelling | 4 | UKL | | Product Line Engineering | 4 | UKL | | Protocol Engineering | 4 | UKL | | Regression and Time series analysis | 8 | UKL | | Software Engineering Seminars | 4 | UKL | | Software Quality | 8 | UKL | | Advanced Internet Technologies | 8 | unibz | | Advanced Programming Techniques for Software Engineering | 8 | unibz | | Advanced Statistics for Data Mining | 12 | unibz | | IT and service management | 8 | unibz | | Lean start up | 8 | unibz | | Mobile System Engineering | 8 | unibz | | EMSE Project | 8 | unibz | | Research Methods | 2 | unibz | | Seminars in Software and IT Engineering | 4 | unibz | | Statistical methods | 4 | unibz | | Seminars in Machine Interaction | 4 | unibz | | Advances in Software Engineering | 6 | UPM | | Agent Based Software Engineering | 6 | UPM | | Agile Software Development: Agile Practices and Agile Usability | 4 | UPM | | Challenges for accessible computing for people with functional diversity | 4 | UPM | | Critical Software | 3 | UPM | | Data Engineering | 4 | UPM | | Distributed and Outsourced Software Engineering | 4 | UPM | | Interaction Design | 6 | UPM | | Management, Relationships and Communication in Working Groups | 4 | UPM | | Software Engineering Economics | 3 | UPM | | |