COURSE DESCRIPTION – ACADEMIC YEAR 2017/2018

Course title	**Empirical Software Engineering Research**
Course code	76004
Scientific sector	INF/01
Degree	European Master in Software Engineering (LM-18)
Semester	2
Year	1
Credits	8
Modular	No

Total lecturing hours	48
Total lab hours	24
Total exercise hours	--
Attendance	Not compulsory
Prerequisites	Basics of Object-Oriented programming and statistics
Course page	TBD

Specific educational objectives	The course belongs to the type caratterizzanti – discipline informatiche (EMSE – ESER 8). This topic defines the paradigms, methods, and programming techniques of scientific investigation in software engineering. Students learn how to conduct experiments, surveys and studies in real environments as well as how to measure and analyse data and software artefacts with the use and development of programming techniques. The course is designed to give an overview of the research techniques in software engineering and apply some of such techniques to research problems.

Lecturer	Ilenia Fronza
Contact	Piazza Domenicani 3, Room 1.08, Ilenia.Fronza@unibz.it, +39 0471 016247
Scientific sector of lecturer	INF/01
Teaching language	English
Office hours	Arrange beforehand by email.
Lecturing Assistant (if any)	Nabil El Ioini
Contact LA	Piazza Domenicani 3, Room 1.08, nabil.elioini@inf.unibz.it, +39 0471 016138
Office hours LA	Arrange beforehand by email.
List of topics	• Paradigms of scientific investigation in Software Engineering • Tools for Software Engineering Research • Programming Languages and Environments • Data Analysis and Interpretation • Data Modeling • Mining approaches and techniques • Advanced Software Development • Developing Research Projects

Teaching format	Frontal lectures and labs (exercises). The labs will allow students to get practical experience and apply the concepts learned during the lectures.

Learning outcomes	Knowledge and understanding: • Know the different applications of Software Engineering, also in relation to the context of local, national and international economics • Be able to work with a great degree of autonomy, also taking responsibility of projects and structures Applying knowledge and understanding: • Be able to apply empirical analysis fundamentals of ICT data for the construction of mathematical models for the evaluation and prediction of the applications' features and software systems • Be able to plan and carry out information systems' experimental stress analyses in order to acquire measures related to their behaviour and evaluate experimental hypothesis in the industrial sector or in the applied research Making judgments • Be able to autonomously select documents from different sources, including technical books, digital libraries, scientific technical journals, web portals, open source software and hardware Communication skills • Be able to present in a given time the content of a scientific / technical report to an audience also of non-specialists • Be able to prepare and present technical topics in English Learning skills • Be able to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation in English. • Be able to formulate and validate theories and define new methods through empirical induction

Assessment	Lab exercises and project work [50% of mark] + final exam (written) [50% of mark]. The written exam is needed to assess the students' understanding of the topic's key principles. The laboratory exercises are needed to assess the students' ability to work with examples, applications and real systems. The written project report is needed to assess ability to work in a team, creativity, identification of interesting research questions to investigate in the group project, effectiveness in the results and lessons learned presentation. Lab exercises and the final exam are mandatory, and both must be positive in order to pass the exam. In case of a positive mark for the project, the mark will count for the remaining regular exam sessions of the academic year. In case of negative evaluation of the project, a new project needs to be submitted for the next session. Students can choose between two modalities to prepare the project work. • Step-by-step, which means completing successfully the lab

	exercises and project work. • All-in-one, which means preparing the project work and presenting it before the final exam. Projects and lab exercises have to be evaluated BEFORE the final exam, otherwise the exam cannot be registered.
Assessment language	English
Evaluation criteria and criteria for awarding marks	Relevant for the Theory assessment: correctness of answers, clarity of answers, ability to summarize, deep understanding of experimental designs, methodologies, and data analysis techniques. Relevant for the Practice assessment: ability to work in a team, creativity, individual contribution, skills in critical thinking, identification of interesting research questions to investigate in the group project, effectiveness in the results and lessons learned presentation.

Required readings	Experimentation in Software Engineering. C. Wohlin, P. Runeson, M. Höst, M.C. Ohlsson, B.Regnell, A. Wesslén. Springer, 2012 Software Metrics – A Rigorous & Practical Approach. N. Fenton, S. Pfleeger. Students will be exposed to current topics of research by reading papers provided during the lectures
Supplementary readings	Lecture notes and papers will be handed out during the course
Software used	--