# 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 Lecture 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.

<table>
<thead>
<tr>
<th>Assessment language</th>
<th>English</th>
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<tbody>
<tr>
<td>Assessment typology</td>
<td>Monocratic commission</td>
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<tr>
<td>Evaluation criteria and criteria for awarding marks</td>
<td>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.</td>
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|                        | 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           | -- |
