Syllabus

Course Description

Course Title	From Signals to Insights: Mastering Sensor Data
Course Code	46090
Course Title Additional	
Scientific-Disciplinary Sector	ING-INF/05
Language	English
Degree Course	PhD Programme in Advanced-Systems Engineering
Other Degree Courses (Loaned)	
Lecturers	Prof. Dr. Michael Haller, Michael.Haller@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/11217 Prof. Dr. Niko Stephan Münzenrieder, Niko.Muenzenrieder@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/42095
Teaching Assistant	
Semester	Second semester
Course Year/s	2025/2026
CP	3
Teaching Hours	30
Lab Hours	
Individual Study Hours	45
Planned Office Hours	
Contents Summary	
Course Topics	This course provides a comprehensive introduction to the evaluation of sensor and user data, covering the entire pipeline from data acquisition to analysis. Participants will learn how to collect data using Arduino-based systems, apply signal filtering techniques, and optimize signal-to-noise ratios for accurate

	measurements. Beyond sensor signals, the course also addresses the collection and interpretation of user data in experimental settings and user studies. Key topics include signal acquisition, data preprocessing, and advanced evaluation methods, with particular emphasis on understanding both quantitative (e.g., numerical performance metrics, statistical analysis) and qualitative (e.g., user feedback, observational data) approaches. By combining theoretical foundations with hands-on practices, the course equips attendees with the skills needed to design, analyze, and evaluate reliable sensing systems and user-centered experiments for diverse applications.
Keywords	Sensor Data Analysis, User Studies, Quantitative Methods, Qualitative Methods, Experimental Evaluation
Recommended Prerequisites	
Propaedeutic Courses	
Teaching Format	Frontal lectures & labs
Mandatory Attendance	
Specific Educational Objectives and Learning Outcomes	
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	The major activity of the class is centered around a group project (in pairs of two), complemented by individual assignments throughout the semester. These assignments are designed to ensure that each student gains practical experience in the design, execution, and analysis of experiments, including both sensor-based measurements and user studies. The project provides an opportunity to integrate theoretical knowledge with hands-on skills in data collection, preprocessing, and the evaluation of quantitative and qualitative findings. At the end of the semester, students must individually present their projects in the exam (and as report), demonstrating both technical competence and critical reflection on the chosen evaluation methods.
Evaluation Criteria	Assessment in this course is based on a combination of individual work and collaborative project development. Students are expected to acquire technical skills in data collection and analysis,

	as well as methodological competence in designing and conducting experiments, including user studies. Marks will be awarded according to the following criteria: Individual assignments (30%): Short tasks throughout the semester that ensure each student gains hands-on experience with sensor data acquisition, signal processing, and the basics of analyzing both quantitative and qualitative data. Group project (40%): Conducted in pairs, the semester-long project requires students to design, implement, and evaluate a system or study that integrates sensor-based data with user data. Emphasis is placed on experimental design, data quality, and methodological rigor. Final presentation and report (30%): At the end of the semester, each student must individually present their project, highlighting the research question, methods used, key findings, and reflections on quantitative and qualitative evaluation. The accompanying written report is assessed for clarity, depth of analysis, and critical reflection.
Required Readings	Byrne, D. (2002). *Interpreting Quantitative Data*. London: SAGE Publications. Field, A. (2017). *Discovering Statistics Using IBM SPSS Statistics* (5th ed.). London: SAGE Publications. Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*(5th ed.). Thousand Oaks, CA: SAGE Publications. Flick, U. (2018). *An Introduction to Qualitative Research* (6th ed.). London: SAGE Publications.
Supplementary Readings	
Further Information	
Sustainable Development Goals (SDGs)	Quality education