Syllabus

Course Description

Course Title	Biofeedback and human measurement for engineering research
Course Code	46089
Course Title Additional	
Scientific-Disciplinary Sector	IINF-04/A
Language	English
Degree Course	PhD Programme in Advanced-Systems Engineering
Other Degree Courses (Loaned)	
Lecturers	Prof. Yuri Borgianni, Yuri.Borgianni@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/35189 Prof. Dr. Angelika Peer, Angelika.Peer@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/38684 dr. Aurora Berni, Aurora.Berni@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/42284 Dott. Isabel Francisca Sota Machado Barradas, Isabel.Barradas@natec.unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/42598
Teaching Assistant	
Semester	First semester
Course Year/s	2025/2026
CP	4
Teaching Hours	40
Lab Hours	
Individual Study Hours	60

Planned Office Hours	
Contents Summary	The course focuses on measurable parameters of the human body, commonly referred as biofeedback, neurophysiologic or biometric measures. These measures are increasingly used in many fields of research, and engineering is of no exception. Biofeedback is particularly popular in those areas characterized by a relevant role of human actions and decisions. Examples include domains where people are asked to interact with artificial elements, such as ergonomics, human-robot, human-computer, and human-product interaction. The main reason for these measures to make inroads in engineering is the enabled possibility to acquire objective data of people's behaviour. While instruments to capture biofeedback originate from the medical field, these are conveniently used to monitor visual behaviour, cognition and effort. Some of the extracted measures are associated with emotional arousal and stress. The course illustrates the main biometric measures involved in engineering research, such as eye- and body-tracking, galvanic skin response, electroencephalography, and electromyography. The course will provide insights into how to design experiments with biometric devices, along with related privacy and ethics considerations. Illustrative applications are provided to support explanations from engineering design, human-robot and human-product interaction, which are most developed research areas at unibz benefitting from biometric tools. Classes benefit from the newly established User Experience Lab and additional equipment owned by unibz, which ensures hands-on learning beyond more theoretical lectures.
Course Topics	Brain imaging techniques Peripheral physiological signals Multimodal signal integration Body tracking Electromyography Eye-tracking Affective computing Brain- and body- computer interfaces Design of experiments Data interpretation Ethics considerations and data privacy in the use of neurophysiologic or biometric devices

Keywords	Biofeedback, biometric tools, physiological signals, human experiments, human behaviour, human-robot interaction, human-product interaction, design of experiments
Recommended Prerequisites	
Propaedeutic Courses	
Teaching Format	The course is structured into lectures and practical experimental activities. The former are aimed to introduce topics and the fundamentals of various neurophysiologic or biometric tools. The latter are mostly conducted in laboratory or in a laboratory setting.
Mandatory Attendance	
Specific Educational Objectives and Learning Outcomes	
Specific Educational Objectives and Learning Outcomes (additional info.)	Attendants can learn how to incorporate physiological information into their experimental activities, and choose which devices are most suitable to acquire relevant data.
Assessment	Attending students are asked to submit a report where they describe the use of neurophysiologic or biometric measures in a case study or a hypothetical research activity and justify the choice of these measures based on the objectives.
Evaluation Criteria	Clarity and correctness of the report. Active participation during the course.
Required Readings	-
Supplementary Readings	-
Further Information	-
Sustainable Development Goals (SDGs)	Quality education