Syllabus

Course Description

Course Title	Materials and technologies for biomimetic systems
Course Code	42810
Course Title Additional	
Scientific-Disciplinary Sector	FIS/03
Language	English
Degree Course	Master in Smart Technologies for Sports and Health
Other Degree Courses (Loaned)	
Lecturers	Prof. Valerio Francesco Annese, Valerio.Annese@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/52215
Teaching Assistant	
Semester	Second semester
Course Year/s	2
CP	6
Teaching Hours	36
Lab Hours	24
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	Advanced knowledge of electronic materials and technologies used in (bio)electronic and biomimetic systems, from the definition of biocompatibility and artificial biomaterials to the chemical/physical/optical/mechanical analysis of bio-interfaces and the modification of (bio)surfaces.
Course Topics	· Biocompatibility and biomaterials; · Bio-interfaces: definition, characterization (e.g., chemical, physical, optical, mechanical), bio-surface modification and treatment; · Overview of electronic materials and technologies employed in

	biomimetic electronics; · Bio-inspired nanostructures and devices: introduction and applications; · (Bio)stimuli responsive structures and materials; · Basics of (bio)sensing principles.
Keywords	Biocompatibility; Biomaterials; Biointerfaces; Biomimetic electronics; Bio-inspired nanostructures; Stimuli-responsive materials; Biosensors; Electronic materials; Neuromorphic Electronics
Recommended Prerequisites	
Propaedeutic Courses	
Teaching Format	Frontal lectures, homework, and laboratories.
Mandatory Attendance	Preferrable. Non-attending students should contact the lecturer at the start of the course to agree on the modalities of the independent study
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding • Knowledge and understanding of the basic principles, techniques and methods for the realization and characterization of biomimetic electronic materials and technologies. Applying knowledge and understanding • Development, characterization and utilization of materials and technologies for biomimetic electronics on the basis of specific performance and functional requirements and realization possibilities. Making judgments · Ability to independently select documentation from various sources, including technical literature, digital library, technical and scientific journals, web portals, hardware or open-source software tools; · Ability to plan and re-plan the work of a technical project and to complete it within specified deadlines and objectives; · Ability to set work objectives that are realistic and compatible with available resources; · Ability to work independently and autonomously in small and large projects and with structural responsibilities. Communication skills • Ability to present the contents of a scientific and technical report within a given timeframe, even to a non-expert audience;

	• Ability to organize and write scientific and technical documentation for project descriptions; • Ability to develop and present technical content in English; • Ability to interact and collaborate with peers or professionals in the context of a project or research activity; • Ability to synthesize knowledge acquired through reading and studying scientific and technical documentation; preparation of reports and presentations. Learning skills: • Ability to independently expand on knowledge acquired during study by reading and understanding scientific and technical documentation in English; • Ability to independently and continuously update oneself on developments in the most important areas of smart systems for sport and health; • Ability to expand knowledge, including incomplete knowledge, in the area of problem solving, taking into account the primary objective of the project; • Ability to formulate and test theories and to define new methods through empirical induction and the tools of next-generation scientific research.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	Oral exam and project work. The mark for each part of the exam is 18-30, or insufficient. The oral exam comprises verification questions, and open questions to test knowledge application skills. It counts for 60% of the total mark. The project consists of a project and verifies whether the student is able to apply the concepts taught or presented in the course to solve concrete problems. It is assessed through a final presentation, a demo, and a project report and can be carried out either individually or in a group of 2 students. It is discussed during the oral exam, and it counts for 40% of the total mark.
Evaluation Criteria	The final mark is computed as the weighted average of the oral exam and the project. The exam is considered passed when both

	marks are valid, i.e., in the range 18-30. Otherwise, the individual valid marks (if any) are kept for all 3 regular exam sessions, until also all other parts are completed with a valid mark. After the 3 regular exam sessions, all marks become invalid. Relevant for the oral exam: clarity of answers; ability to recall principles and methods, and deep understanding about the course topics presented in the lectures; skills in applying knowledge to solve exercises about the course topics; skills in critical thinking. Relevant for the project: skill in applying knowledge in a practical setting; ability to summarize in own words; ability to develop correct solutions for complex problems; ability to write a quality report; ability in presentation; ability to work in teams. Non-attending students have the same evaluation criteria and requirements for passing the exam as attending students.
Required Readings	All the required reading material will be provided during the course and will be available on the blackboard or in electronic format. Copies of the slides will be available as well.
Supplementary Readings	M.V. Gandhi and B.D. Thompson. Smart Materials and Structures, Springer, 1992.
Further Information	Software used: Potentially required software will be provided during the lecture.
Sustainable Development Goals (SDGs)	Quality education