Syllabus

Descrizione corso

Titolo insegnamento	Wearable electronics
Codice insegnamento	42809
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	IINF-01/A
Lingua	Inglese
Corso di Studio	Corso di laurea magistrale in Tecnologie Smart per lo Sport e la Salute
Altri Corsi di Studio (mutuati)	
Docenti	prof. Luisa Petti, Luisa.Petti@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/39580 prof. Valerio Francesco Annese, Valerio.Annese@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/52215
Assistente	
Semestre	Primo semestre
Anno/i di corso	2
CFU	6
Ore didattica frontale	36
Ore di laboratorio	24
Ore di studio individuale	90
Ore di ricevimento previste	14
Sintesi contenuti	Wearable electronics (II year, I term, 6 CFU) • Introduction to wearable electronics for sports and health • Autonomous energy supply for wearables • Multimodal sensing approaches • Biofeedback systems (real-time feedback user experience)

	• Packaging technologies for wearables and implants (e.g., textiles, smart skins, pills) • Wearable system integration
Argomenti dell'insegnamento	- Introduction to Wearable Electronics - Materials & Fabrication Technologies - Wearable Sensors - Read-out Electronics for Wearables - Energy for Wearable Electronics - Fiber & Textile Electronics - Commercial Wearable Devices - Healthcare & Medical Wearables - Wearables for Assistive Technologies - Wearables for Fitness & Nutrition - Other emerging wearable applications - Hands-on Wearable Electronics
Parole chiave	Wearable Electronics Flexible & Stretchable Electronics Wearable Sensors Smart Textiles Wearable Energy Harvesting Wearable Power Healthcare Wearables Assistive Wearables
Prerequisiti	Students are expected to have a good understanding of fundamental electronics and electrical circuits, together with prior knowledge of sensors, measurement systems, programming, and physics.
Insegnamenti propedeutici	
Modalità di insegnamento	Lectures, expert seminars, laboratory activities, and project-based learning, combining theoretical knowledge with hands-on development of wearable electronic systems.
Obbligo di frequenza	attendance is strongly recommended
Obiettivi formativi specifici e risultati di apprendimento attesi	Knowledge of commonly used sensors and biosensors in sports and healthcare applications (e.g., electrochemical, electrophysiological, mechanical, thermal, magnetic, and optical) and of the technologies commonly used to make them; Knowledge of electronic circuit design, with a particular focus on the management, interfacing and communication of (bio)signals for

	the development of electronic systems used in sports and healthcare applications; Knowledge of wearable electronics for sports and healthcare applications, ranging from 'energy harvesters' to sensors and actuators, through to integration and 'packaging' technologies; Knowledge of electronic materials and technologies used in (bio)electronic and biomimetic systems, ranging from the definition of biocompatibility and artificial biomaterials to the chemical, physical, optical and mechanical analysis of bio-interfaces and the modification of (bio)surfaces.
Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	Understand the operating principles, architectures, and enabling technologies of wearable electronic systems, including sensors, embedded electronics, communication technologies, and power solutions. Design, build, and test wearable electronic devices by integrating electronic hardware, embedded software, and data acquisition techniques to meet specified functional requirements. Critically evaluate and justify wearable technology solutions by considering technical performance alongside human factors, ethics, privacy, cybersecurity, regulatory considerations, and the needs of different users and application contexts.
Modalità di esame	50% individual project with written report 50% individual study review in an oral exam
Criteri di valutazione	The project evaluation assesses the quality and functionality of the developed wearable system, the appropriate application of the concepts learned during the course, and the students' ability to address design and technical challenges. Particular attention is given to the quality of the implementation, critical evaluation of the results, technical report, and clarity of the final demonstration and presentation. The oral exam evaluates the student's preparation and understanding of the course content, as well as the ability to apply, analyze, and connect key concepts. Particular attention is given to critical thinking, clarity of communication, and the ability to reflect on the discussed topics and propose appropriate solutions.

Bibliografia obbligatoria	Wearable sensors : fundamentals, implementation and applications Sazonov, Edward, editor. 2021 Available at unibz library: https://unibz.primo.exlibrisgroup.com/permalink/39UBZ_INST/lr6t90/alma991005
Bibliografia facoltativa	Specific sections of the supplementary readings will be indicated during the lectures. Additional teaching materials prepared by the course instructor will also be made available.
Altre informazioni	
Obiettivi di Sviluppo Sostenibile (SDGs)	Istruzione di qualità