Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Flexible Electronics: From Materials to Systems and Applications
Code der Lehrveranstaltung	46060
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	IINF-01/A
Sprache	Englisch
Studiengang	Doktoratsstudium in Advanced-Systems Engineering
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Dr. Zina Fredj Ep Tej, Zina.FredjEpTej@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/52392
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
Studienjahr/e	1
KP	3
Vorlesungsstunden	30
Laboratoriumsstunden	0
Stunden für individuelles Studium	15
Vorgesehene Sprechzeiten	
Inhaltsangabe	The course is a specialized course in the interdisciplinary area of physics, material science, chemistry, biology, biotechnology, and electronics, addressing the implementation of flexible electronics technologies. It is designed to acquire knowledge in flexible electronics device technology, from materials and fabrication processes, to devices, systems, and applications, including state of the art and the status of commercialization.

Themen der Lehrveranstaltung	1. Flexible electronics: general introduction - Historical background - Materials, devices, systems, applications - Fabrication techniques - Unique aspects, status in the field and trends 2. Thin-film microfabrication techniques - Basics and fundamentals - Deposition and structuring methods 3. Printing techniques - Basics and fundamentals - Fluid formation and rheology for printing - Inks and printing techniques - Additional coating and structuring methods 4. Thin-film transistors and circuits - Thin film transistors (TFTs) - Device operation, materials, and structures - Device characterization and performance - UNIBZ's case study: sub-micrometer Indium-Gallium-Zinc-Oxide TFTs and spray-coated carbon nanotube TFT - Thin film circuits - From transistors to circuits - Digital and analog circuits 5. From thin-film transistors to biosensors - Transistors-based sensors - Principles and fundamentals - Examples - Unibz's case study: electrolyte-gated field effect transistors and organic electrochemical transistors 6. Applications - Examples applications from academia and industry
Stichwörter	Flexible electronics; printed electronics; stretchable electronics; organic electronics; functional materials; flexible substrates; conductive polymers; nanomaterials; thin films; fabrication techniques; additive manufacturing; device integration; flexible

	sensors; wearable devices; electronic skin; energy harvesting; biomedical applications; commercialization.
Empfohlene Voraussetzungen	
Propädeutische Lehrveranstaltungen	
Unterrichtsform	Digital format (provided on teams) divided in: - Theoretical lectures using: - Slides - Videos - Practical exercises: - Use of softwares (e.g., Origin, Corel) for data analysis and plotting. - Projects & assignments: - Informal discussions on presentations and scientific papers - Preparation of short papers based on literature review
Anwesenheitspflicht	Preferred
Spezifische Bildungsziele und erwartete Lernergebnisse	The specific educational objectives are to: - Acquire basic understanding and knowledge of printing and microfabrication technologies. - Acquire basic understanding and knowledge of device operation mechanisms (especially for what concerns thin-film transistors and transistor-based sensors).
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	A project work developed by the student will be assessed: presentation and discussion of a topic related to the contents of the course agreed between lecturer and students.
Bewertungskriterien	Quality of the presentation and engagement in the practical project.
Pflichtliteratur	assigned in class
Weiterführende Literatur	Bibliography: • “Organic Flexible Electronics: Fundamentals, Devices, and

	Applications", P. Coseddu and M. Caironi, Elsevier, 2020. • "Organic and Amorphous-Metal-Oxide Flexible Analogue Electronics", V. Pecunia, M. Fattori, S. Abdinia, H. Sirringhaus, and E. Cantatore, Cambridge Elements, 2018. • "Organic and Printed Electronics: Fundamentals and Applications", G. Nisato, D. Lupo, S. Ganz, CRC Press, 2016. • "Large Area and Flexible Electronics", M. Caironi and Y.Y. Noh, WILEY-VCH, 2015. • "Flexible Electronics: Materials and Applications", W. S. Wong, A. Salleo, Springer, 2009.
Weitere Informationen	
Ziele für nachhaltige Entwicklung (SDGs)	Hochwertige Bildung