Fakultät für Ingenieurwesen
Facoltà di Ingegneria
Faculty of Engineering

COURSE DESCRIPTION – ACADEMIC YEAR 2024/2025

Course title	**Dispositivi Elettronici**
Course code	42409
Scientific sector	ING-INF/01
Degree	Bachelor in Electronics and Cyber-physical Systems (L-8)
Semester	1
Year	2
Credits	9
Modular	No

Total lecturing hours	54
Total tutorials and lab hours	36
Attendance	Preferrable. Non-attending students should contact the lecturer at the start of the course to agree on the modalities of the independent study
Prerequisites	Mathematical Analysis I, Mathematical Analysis II, Physics I, Physics II
Course page	Teams

Specific educational objectives	The objective of this course is an understanding of the physics and operation of semiconductor devices. Specifically, understanding of the formation and behavior of metal-semiconductor contacts, basic knowledge of nanotechnology and microfabrication, understanding of operation and design of MOSFETs, bipolar transistor and JFET, and understanding of the operation of memories, optical devices and sensors.

Lecturer	Prof. Paolo Lugli Prof. Luisa Petti
Contact	paolo.lugli@unibz.it luisa.petti@unibz.it
Scientific sector of lecturer	ING/INF-01 – ELECTRONICS
Teaching language	Italian
Office hours	After consultation and agreement with lecturers
Lecturing assistant (if any)	Dr. Guglielmo Trentini
Contact LA	guglielmo.trentini@student.unibz.it
Office hours LA	After consultation and agreement with TAs

List of topics	The topics covered include: - physics of semiconductor materials (e.g., crystal structure, energy bands, density of states, dopants, equilibrium statistics, non-equilibrium behavior and electronic transport); - nanotechnology; - pn junctions and diodes; - MOSFETs; - JFETs; MESFETs - bipolar junction transistors; - optical devices; - memories;
	- sensors.
Teaching format	Frontal lectures, homeworks, exercises, and laboratories.

Learning outcomes	Knowledge and understanding - Have a solid knowledge of semiconducting materials and devices; - Know the concepts of semiconducting carrier transport and of device operation; Applying knowledge and understanding - Be able to design electronic devices and choose the proper materials for them - Be able to properly use physical units Making judgements - Be able to think "out-of-the-box" when facing problems and critical issues Learning skills - Develop learning capabilities and autonomous thinking in order to pursue effectively further studies

Assessment	The exam will be in written form. One part will relate to the lecture topics, one other to the exercises. Students will have the choice to take 2 midterm exams (if negative, the students will have to take the final written exam including all covered topics). The students will have the possibility to substitute part of the written exam with a group project to be carried out during the semester and concluded by an oral presentation.
Assessment language	Italian
Evaluation criteria and criteria for awarding marks	The assessment criteria will be the accuracy of the answers given in the written examination, with particular attention to the resolution procedure adopted and the formal correctness of the same.

Required readings	"Semiconductor Physics and Devices", Donald A. Neamen.
Supplementary readings	"Elettronica di Millman", Jacob Millman, Arvin Grabel, Pierangelo Terreni.