GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics of semiconductor devices, PG_00037293		
Field of study	Technical Physics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor		
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	60	5.0	60.0	125

Subject objectives

The aim of this course is to understand fundamental physics of semiconductors and devices based on semiconductors.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W07] has knowledge of the construction and operation of physical instruments, measurement and research equipment	Student knows how semiconductor devices work.	[SW1] Assessment of factual knowledge
[K6_W02] has systematized knowledge of the basics of physics, including mechanics, thermodynamics, electricity and magnetism, optics, atomic and particle physics, solid-state physics, nuclear and elementary particle physics	The knowledge allows to analyze selected problems concerned semiconductors and semiconductor devices in real world	[SW1] Assessment of factual knowledge
[K6_U01] learns independently, obtains information from literature, databases and other properly selected sources	Student knows how to use literature and databases in semiconductors and semisonductor devices	[SU2] Assessment of ability to analyse information

Subject contents

Introduction to solid state physics (structure of crystalline solids, types of chemical bonds in solids, phonons, Fermi-Dirac and Bose-Einstein statistics, Fermi level in metals, electrical conduction in metals, band structure of solids, effective mass). Introduction to semiconductors (electronic hole, Fermi level in semiconductors, direct and indirect energy gap, equilibrium concentration, intrinsic and extrinsic semiconductors, donors and acceptors, generation and recombination of charge carriers, Hall effect). Introduction to semiconductor electrodynamics (mobility of carries, drift and diffusion equations, Poisson equation, continuity equation, space charge, dielectric relaxation, ambipolar transport equation). Semiconductor devices (Hall efect sensor, diode, transistor, LED, diode laser, photoresistor, photovoltaic cell). Injection, termionic and optical effects in devices.

Prerequisites and co-requisites

Completed courses in "Electricity and magnetism" and "Introduction to modern physics"

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exercises	50.0%	40.0%
Written exam	50.0%	60.0%

Recommended reading	Basic literature	1. C. Kittel "Introduction to solid state physics", PWN 2. A. van der Ziel "Fundaments of solid state electronics" WNT 3. J. Hennel "Introduction to semiconductor elektronics" WNT
	Supplementary literature	A.K. Jonscher "Fundaments of semiconductor devices" WNT
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Electronic structure of solid states 2. Intrinsic and extrinsic semiconductors 3. Diode 4. Transistor 5. Laser diode	
Work placement	Not applicable	

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