UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2021/2022
BACHELOR'S DEGREE (BSC)	ELECTRONICS ENGINEERING
SUBJECT	SOLID STATE ELECTRONICS
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10655-Attività formative affini o integrative
CODE	14920
SCIENTIFIC SECTOR(S)	ING-INF/01
HEAD PROFESSOR(S)	CUSUMANO PASQUALE Ricercatore Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	153
COURSE ACTIVITY (Hrs)	72
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**CUSUMANO PASQUALE** Monday 8:00 8:01 Si prega di concordare il ricevimento via mail: pasquale.cusumano@unipa.it Please arrange in advance by sending an email request to: pasquale.cusumano@unipa.it

DOCENTE: Prof. PASQUALE CUSUMANO

PREREQUISITES	Physics 1, Physics 2
LEARNING OUTCOMES	Knowledge and understanding skills In this course the student learns the basic elements of modern physics and matarial technology necessary for a simple learning of the topics that he/she will later study in the course on Semiconductor Devices. Ability to apply the acquired knowledge and understanding. By attending this course, the student will be able to apply his/her knowledge both for the future study of the structure and operation of the main solid-state devices. Independent judgment ability. During the course, special attention is paid for stimulating the capability of evaluating the relevance of modern physics and its fundamental role in modern electronic devices. Communication skills The course stimulates the communication abilities of each students, in relation to the specific topics faced durign the classes. For verifying such abilities, besides a written test the final examination may include a short presentation on one topics discussed during the classes.
ASSESSMENT METHODS	One written test (two hours) and one oral examination where the written test is discussed. The final score is in units of 30.
EDUCATIONAL OBJECTIVES	The course offers a synthesis of the main concepts of solid state physics and related technologies, aimed at a simpler and graded study of the topics presented in the next course on Semiconductor Devices.
TEACHING METHODS	Classes and homeworks.
SUGGESTED BIBLIOGRAPHY	Dispensa C. Arnone "Note di Elettronica dello Stato Solido" A.A. 2020-2021. Si consiglia anche come riferimento S.M.Sze, M.K. Lee "Semiconductor Devices Physics and Technology", 3rd edition, Wiley 2012 che risulta utile anche per il corso successivo Dispositivi Elettronici.

SYLLABUS

Hrs	Frontal teaching
10	Introduction to post-Newton physics and its role on the development of modern solid state devices.
1	Mesurement units used in electronics.
2	Charge ballistics in electric or magnetic fields.
1	Solid state: crystals, polycrystals, amourphous materials, superstructures.
2	Wave-particle duality.
1	Wave function and energy levels for isolated atoms.
1	Electronic structure of elements.
2	Electronc structure and chemical bonds.
1	Ideal crystals: structure, orientation, lattice planes.
1	Electron motion in a periodic potential sysytem.
1	Energy bands in crystals.
2	Potential field in metals. Fermi-Dirac distribution.
1	Work function. Contact potential.
2	Energy bands in semiconductors.
2	Technology of Silicon crystal growth
1	Intrinsic and doped semiconductors.Fermi level.
2	Doping technology
2	Conduction in semiconductors: electrons and holes.
1	Photoconduction in semiconductors. Internal photoelectric effect.
2	Non-equilibrium conditions and carrier diffusion.
2	Radiative and non-radiative recombination. Direct and indirect gap. E-k diagrams.
2	Overview of oxidation technology and microlitography.

Hrs	Practice
1	Mesurement units used in electronics.
2	Charge ballistics in electric or magnetic fields.
1	Solid state: crystals, polycrystals, amourphous materials, superstructures.
1	Wave-particle duality.
1	Wave function and energy levels for isolated atoms.

Hrs	Practice
1	Energy bands in semiconductors.
1	Intrinsic and doped semiconductors.Fermi level.
1	Doping technologiy.
2	Conduction in semiconductors: electrons and holes.
1	Photoconduction in semiconductors. Internal photoelectric effect.
1	Non-equilibrium conditions and carrier diffusion.