UNIVERSITÀ DI PAVIA

Anno Accademico 2018/2019

QUANTUM ELECTRONICS

Anno immatricolazione	2017/2018
Anno offerta	2018/2019
Normativa	DM270
SSD	FIS/03 (FISICA DELLA MATERIA)
Dipartimento	DIPARTIMENTO DI INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE
Corso di studio	ELECTRONIC ENGINEERING
Curriculum	Microelectronics
Anno di corso	2°
Periodo didattico	Primo Semestre (01/10/2018 - 18/01/2019)
Crediti	6
Ore	50 ore di attività frontale
Lingua insegnamento	English
Tipo esame	SCRITTO E ORALE CONGIUNTI
Docente	PIRZIO FEDERICO (titolare) - 6 CFU
Prerequisiti	The Mathematical and Physical concepts given by the 1st Level Degree (Mechanics and Electromagnetism, Geometry and Algebra, Mathematical Methods courses). The concepts illustrated in the course of “Fotonica” (Photonics) are important but not essential
Obiettivi formativi	The aim of the course is to introduce the basics of Quantum Physics, study the Matter-Radiation Interaction and the physics behind LASERS.
Programma e contenuti	Wave-particle duality, experimental facts Quantum Mechanics Postulates, Schrödinger Equation Eigenvalue problems, some examples of representative potentials Angular momentum, Hydrogen Atom and Periodic Table of Elements Identical Particles, Spin, Fermions and Bosons Statistics Time Independent Perturbation Theory Time Dependent Potentials, Perturbative method

	Electric Dipole interaction Fermi Golden Rule Absorption, Spontaneous and Stimulated Emission, Einstein's A and B coefficients Density Matrix, radiation-matter interaction 3- and 4-levels systems, rate equations Optical resonators Free running laser operation Q-Switching and Mode-Locking regimes Some representative example of lasers (Gas lasers, Solid-state lasers, Fiber Lasers, Semiconductor Lasers)
Metodi didattici	Lectures (hours/year in lecture theatre): 45 Practical class (hours/year in lecture theatre): 0 Practicals / Workshops (hours/year in lecture theatre): 0
Testi di riferimento	There are many wonderful books about the topics we will cover in this Course. A lot of them are available at the Faculty Library. I will not follow a specific textbook, but students can refer to: A. Yariv. Quantum Electronics. Wiley. D. J. Griffiths. Introduction to Quantum Mechanics (2nd Edition). Pearson Prentice Hall. C.L. Tang. Fundamentals of quantum mechanics, for solid state electronics and optics. Cambridge University Press. W. Koechner. Solid.State Laser Engineering (6th Edition). Springer. This book can be considered the "Holy Bible" of solid-state lasers Engineers.
Modalità verifica apprendimento	The final exam will consist of an oral discussion or in a written test aimed to verify the effective acquisition of the concepts introduced in the course.
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Obiettivi Agenda 2030 per lo sviluppo sostenibile	$lbl_legenda_sviluppo_sostenibile