



| QUANTUM ELECTRONICS | |
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| Anno immatricolazione | 2018/2019 |
| 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 | Photonics |
| Anno di corso | 1° |
| 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 |

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| | <p>Electric Dipole interaction</p> <p>Fermi Golden Rule</p> <p>Absorption, Spontaneous and Stimulated Emission, Einstein's A and B coefficients</p> <p>Density Matrix, radiation-matter interaction</p> <p>3- and 4-levels systems, rate equations</p> <p>Optical resonators</p> <p>Free running laser operation</p> <p>Q-Switching and Mode-Locking regimes</p> <p>Some representative example of lasers (Gas lasers, Solid-state lasers, Fiber Lasers, Semiconductor Lasers)</p> |
| Metodi didattici | <p>Lectures (hours/year in lecture theatre): 45</p> <p>Practical class (hours/year in lecture theatre): 0</p> <p>Practicals / Workshops (hours/year in lecture theatre): 0</p> |
| Testi di riferimento | <p>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:</p> <p>A. Yariv. Quantum Electronics. Wiley.</p> <p>D. J. Griffiths. Introduction to Quantum Mechanics (2nd Edition). Pearson Prentice Hall.</p> <p>C.L. Tang. Fundamentals of quantum mechanics, for solid state electronics and optics. Cambridge University Press.</p> <p>W. Koechner. Solid.State Laser Engineering (6th Edition). Springer. This book can be considered the "Holy Bible" of solid-state lasers Engineers.</p> |
| Modalità verifica apprendimento | <p>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.</p> |
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| Obiettivi Agenda 2030 per lo sviluppo sostenibile | <p>\$Ibl legenda sviluppo sostenibile</p> |