



Corso di Laurea in
**SCIENZA E TECNOLOGIA
DEI MATERIALI**

Triennale – L30

Principali informazioni sull'insegnamento	
Denominazione dell'insegnamento	MATHEMATICAL METHODS OF PHYSICS AND INSTITUTIONS OF THEORETICAL PHYSICS MOD. A
Corso di studio	MATERIALS SCIENCE AND TECHNOLOGY
Crediti formativi universitari (CFU) / European Credit Transfer and Accumulation System (ECTS):	: 6
SSD	FIS/02 - FISICA TEORICA, MODELLI E METODI MATEMATICI
Lingua di erogazione	ITALIAN
Periodo di erogazione	I semestre 2021-2022
Obbligo di frequenza	Optional

Docente	
Nome e cognome	Luigi Tedesco
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Telefono	
Sede	Dipartimento di Fisica Interateneo di Bari
Sede virtuale	
Ricevimento (giorni, orari e modalità)	15-18 lunedì – mercoledì e venerdì

Syllabus	
Obiettivi formativi	The training unit of Institutions of Theoretical Physics aims to introduce the student to Quantum Mechanics through the study of the principles of the problem passing through the themes of quantum mechanics in its basic training.
Prerequisiti	Basic notions of real analysis, infinitesimal calculus, electromagnetism
Contenuti di insegnamento (Programma)	<ul style="list-style-type: none">- Black body spectrum and Planck's hypothesis; photoelectric effect; Compton effect; visible spectral analysis of hydrogen.- Rutherford atomic model; Bohr's atomic model; wave-particle duality; Bohr's principle of complementarity; uncertainty principle.- Deduction of the Schroedinger equation; physical interpretation of the Schroedinger equation; interpretation of Born; physical meaning of the wave function; classical and quantum probability; physical meaning of the Schroedinger equation; normalization of the wave function; continuity equation and its physical meaning.- Solution for free particle; dispersion relationship; separable Schroedinger equation; confined particle; step potential; rectangular potential well; potential barrier and tunnel effect.- Average values, impulse and position expectation values;- Classical and quantum harmonic oscillator and its properties.- Angular momentum and its properties.- Pauli principle; Fermi energy.- Spin and related properties.- Electronic states in a metal.- 21 cm radiation of hydrogen.- Hydrogen atom.-Hints of relativity 'special property'



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Testi di riferimento	Lecture notes - D. J. Griffiths "Introduction to Quantum Mechanics" Prentice Hall
Note ai testi di riferimento	

Organizzazione della didattica			
Ore			
Totali	Didattica frontale	Pratica (laboratorio, campo, esercitazione, altro)	Studio individuale
150	32	30	88
CFU/ETCS			
6	4	2	

Metodi didattici	Lectures and exercises

Risultati di apprendimento previsti	
Conoscenza e capacità di comprensione	Basic knowledge of the acquired notions. Ability to learn the principles of quantum mechanics of simple atoms.
Conoscenza e capacità di comprensione applicate	Understanding the methodologies and logic of quantum mechanics. Ability to analyze and describe atomic phenomena. Ability to analyze the data and correctly interpret the experimental results.

Valutazione	
Modalità di verifica dell'apprendimento	Through analysis and discussion of the phenomena described in class and through the ability to correctly use the language of quantum mechanics and rigorously describe atomic phenomena such as physical observables, eigenvectors, etc.
Criteri di valutazione	<p>Autonomy of judgment: evaluating themselves and others after an argument</p> <p>Communication skills: comparing arguments apparently unrelated to each other</p> <p>Ability to learn: through discussion in the classroom and exercises to be carried out</p>
Criteri di misurazione dell'apprendimento e di attribuzione del voto finale	Analysis of the theory and exercises, using a criterion that possibly identifies errors and their severity.
Altro	