

# MATERIALS ENGINEERING AND NANOTECHNOLOGY (LM56)

(Lecce - Università degli Studi)

## Teaching PHYSICS OF MATTER MOD. I (Int)

GenCod A003097

**Owner professor** Nicola LOVERGINE

**Reference professor for teaching**  
ELEONORA ALFINITO

**Teaching in italian** PHYSICS OF MATTER  
MOD. I C.I.

**Teaching** PHYSICS OF MATTER MOD. I (Int) **Language** INGLESE

**SSD code** FIS/03

**Curriculum** PERCORSO COMUNE

**Reference course** MATERIALS  
ENGINEERING AND

**Course type** Laurea Magistrale

**Location** Lecce

**Credits** 6.0

**Semester** Primo-Semestre

**Teaching hours** Ore-Attività-frontale:  
54.0

**Exam type** Orale

**Assessment**

**For enrolled in** 2020/2021

**Course timetable**

**Taught in** 2020/2021

<https://easyroom.unisalento.it/Orario>

### BRIEF COURSE DESCRIPTION

This is a course in theory and models in physics of matter; it aims to furnish some basic knowledge concerning quantum physics of atoms, molecules and solids.

### REQUIREMENTS

Sufficiency in calculus, probability theory, linear algebra, electromagnetism

### COURSE AIMS

#### **Knowledge and understanding**

The course provides a basis and an opportunity for originality in developing or applying ideas in a material physics research context .

#### **Applying knowledge and understanding:**

The course provides abilities in problem solving applied in new or unfamiliar environments within classical and quantum physics contexts .

#### **Making judgements:**

The course gives the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete data to discriminate between the classical and quantum regime, to evaluate the appropriate set of approximations to be used.

#### **Communication**

Students have to be able to communicate their conclusions and rationale to specialist , by using a technical language based on formulas and theorems, and non-specialist audiences by using a narrative language based on elementary concepts.

#### **Learning skills**

Students are trained to develop creative thinking, critical spirit, and autonomy , by using as a knowledge technique examples and counter-examples. The theoretical approach of the course is a good tool to improve their ability of abstraction

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## TEACHING METHODOLOGY

teacher-led discussion and assignments

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## ASSESSMENT TYPE

Physics of matter I is only the first modulus of the complete course named Physics of matter. There a single final exam which includes the contents of modulus I and modulus II  
The exam consists of two cascaded parts:  
the first part is written test (duration: two hours and a half); the student is asked to solve exercises ; it is aimed to verify to what extent the student has gained the ability to apply theory to solve simple case studies;  
the second part is an oral test aimed to determine to what extent the student has gained an overall knowledge of the main topics of the course.

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## OTHER USEFUL INFORMATION

This is a course in theory and models in physics of matter; it aims to furnish some basic knowledge concerning quantum physics of atoms, molecules and solids.

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## FULL SYLLABUS

Introduction: Physics and tecnology from the end of 1800 to today (3 hours). Mechanical and electromagnetic waves (2 hours). Special relativity (5 hours). Elements of probability and the Maxwell distribution (5 hours). The quantum nature of light (5 hours). Atomic models and the matter wave (5 hours). Quantum mechanics in one dimension (12 hours). The angular momentum (5 hours). The hydrogen atom, eigenvalues and eigenfunctions (3hours). Quantum statistics (2 hours). Multielectron atoms (2hours). Introduction to molecules (5 hours).

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## REFERENCE TEXT BOOKS

- [1] R. Eisberg, R. Resnick, "Quantum Physics", J. Wiley and Sons.
- [2] R.A. Serway, C. J. Moses, C. A. Mojer, "Modern Physics", Saunders College
- [3] M. Born, "Atomic Physics", Dover Books on Physics
- [4] R. Gautreau, W. Savin, "Schaum's Theory and Problema in Modern Physics"