Master's Degree
Material Physics

tech global university

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Master's Degree
Material Physics

» Modality: **online**
» Duration: **12 months.**
» Certificate: **TECH Global University**
» Accreditation: **60 ECTS**
» Schedule: **at your own pace**
» Exams: **online**

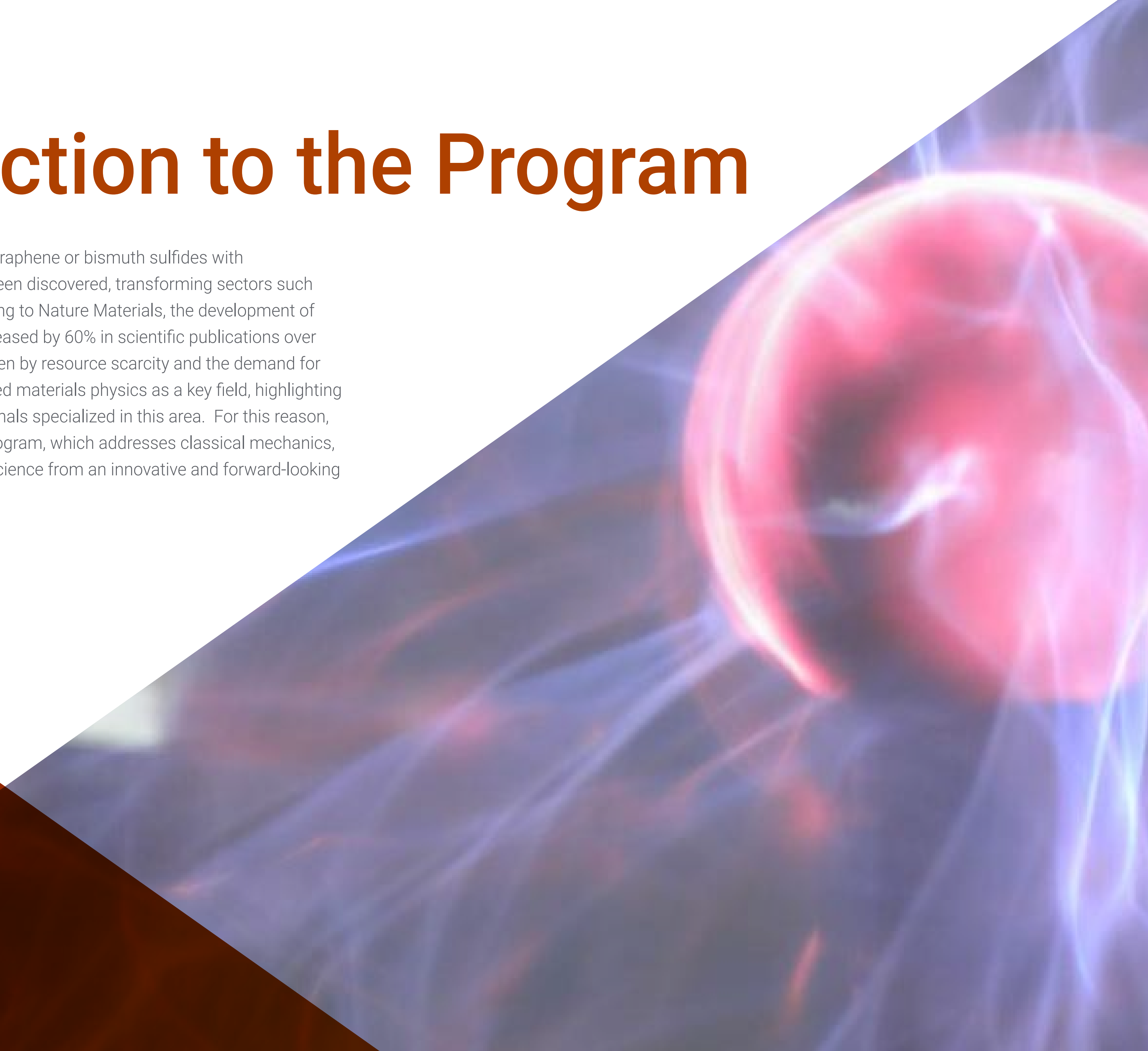
Website: **www.techtitute.com/us/engineering/master/master-material-physics**

Index

01

Introduction to the Program

In recent years, materials such as graphene or bismuth sulfides with superconducting properties have been discovered, transforming sectors such as energy and electronics. According to Nature Materials, the development of advanced functional materials increased by 60% in scientific publications over the last decade. This evolution, driven by resource scarcity and the demand for sustainable solutions, has positioned materials physics as a key field, highlighting the importance of having professionals specialized in this area. For this reason, TECH presents this 100% online program, which addresses classical mechanics, electromagnetism, and materials science from an innovative and forward-looking approach.



Master the superposition of waves with perpendicular electric vectors and understand its impact on the propagation of light”

The scientific community that focuses its studies on Materials Physics continues to make progress and provide society with greater knowledge about new properties of existing resources, the development of nanomaterials and the promotion of other technological, biological or health disciplines. A form of progress in which engineering professionals can make a significant contribution through the direct application of techniques and concepts from physics.

At the same time, the need to find new, more effective, efficient and sustainable materials has driven this area, both from the private and public sectors. An expanding field of study for engineering specialists who wish to thrive in the field of Materials Physics. For this reason, TECH has created this Master's Degree, where over course of 12 months, the graduate will obtain the necessary knowledge about fluid mechanics, advanced thermodynamics and optics.

All this, in addition, with a university program that has educational tools in which the latest academic teaching technology has been used. Therefore, through video conferences, detailed videos or case study simulations, students will be able to delve, in a much more dynamic way, into symmetries and conservation laws, the handling of Navier-Stokes equations or the connection between the microscopic structure (atomic, nanometric or micrometric) and the macroscopic material properties.

This way, TECH offers engineering professionals the most advanced and exhaustive knowledge on Materials Physics. All this through an exclusively online program that you can access whenever and wherever you want. Students only need an electronic device (computer, tablet or cell phone) with Internet connection to be able to view the information on the virtual platform.

This **Master's Degree in Materials Physics** contains the most complete and up-to-date university program on the market. Its most notable features are:

- The development of practical cases presented by experts in Materials Physics
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where self-assessment can be used to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an internet connection

"Learn to interpret the macroscopic Maxwell equations, which are fundamental for the analysis of electromagnetic fields"

TECH adapts to your needs and has therefore created a university degree program in which you can distribute the academic workload according to your requirements"

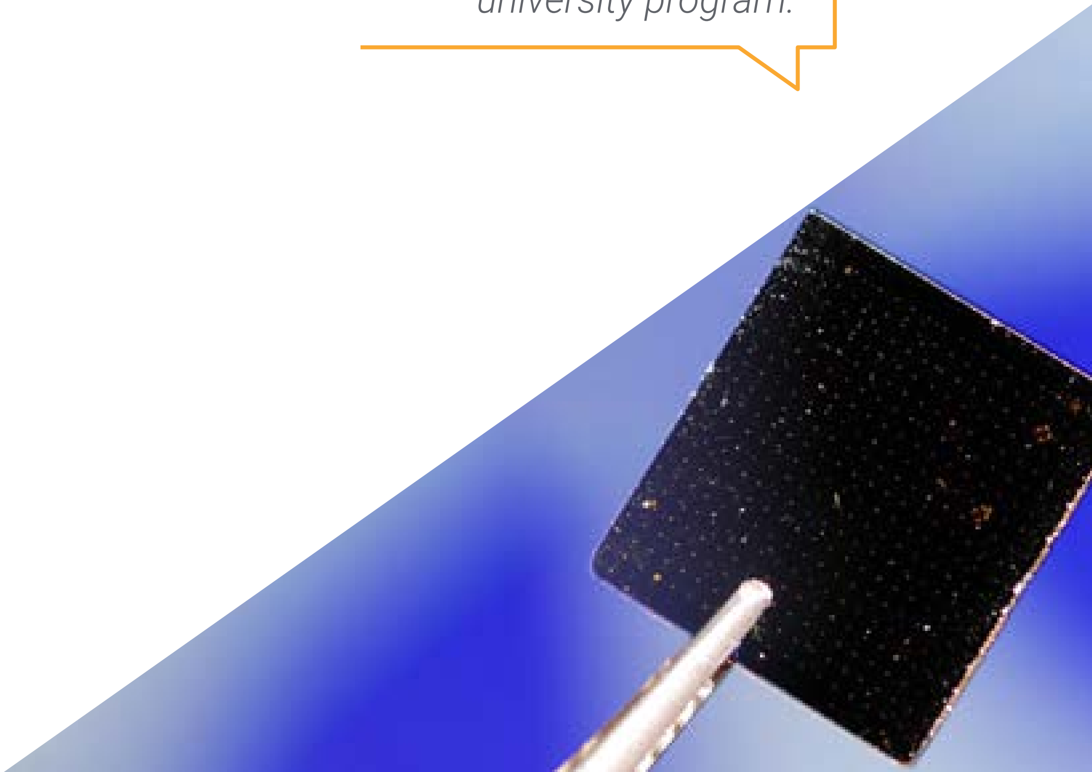
Delve into the electromagnetic theory of light and how materials respond to electric and magnetic fields.

Gain essential knowledge about magnetostatics in both material media and vacuum with this university program.

Its teaching staff includes professionals from the field of materials physics, who contribute to this program the experience gained through their work, as well as renowned specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide an immersive learning experience designed to prepare for real-life situations.

This program is designed around Problem-Based Learning, whereby the student must try to solve the different professional practice situations that arise throughout the program. For this purpose, the professional will be assisted by an innovative interactive video system created by renowned and experienced experts.



02

Why Study at TECH?

TECH is the world's largest online university. With an impressive catalog of more than 14,000 university programs, available in 11 languages, it is positioned as a leader in employability, with a 99% job placement rate. In addition, it has a huge faculty of more than 6,000 professors of the highest international prestige.

Study at the largest online university in the world and ensure your professional success. The future begins at TECH"

The world's best online university, according to FORBES

The prestigious Forbes magazine, specialized in business and finance, has highlighted TECH Euromed University as "the best online university in the world" This is what they have recently stated in an article in their digital edition in which they echo the success story of this institution, "thanks to the academic offer it provides, the selection of its teaching staff, and an innovative learning method oriented to form the professionals of the future".

The most complete syllabuses on the university scene

TECH Euromed University offers the most complete syllabuses on the university scene, with programs that cover fundamental concepts and, at the same time, the main scientific advances in their specific scientific areas. In addition, these programs are continuously updated to guarantee students the academic vanguard and the most demanded professional skills. and the most in-demand professional competencies. In this way, the university's qualifications provide its graduates with a significant advantage to propel their careers to success.

The best top international faculty

TECH Euromed University's faculty is made up of more than 6,000 professors of the highest international prestige. Professors, researchers and top executives of multinational companies, including Isaiah Covington, performance coach of the Boston Celtics; Magda Romanska, principal investigator at Harvard MetaLAB; Ignacio Wistumba, chairman of the department of translational molecular pathology at MD Anderson Cancer Center; and D.W. Pine, creative director of TIME magazine, among others.

A unique learning method

TECH Euromed University is the first university to use Relearning in all its programs. This is the best online learning methodology, accredited with international teaching quality certifications, provided by prestigious educational agencies. In addition, this innovative academic model is complemented by the "Case Method", thereby configuring a unique online teaching strategy. Innovative teaching resources are also implemented, including detailed videos, infographics and interactive summaries.

The world's largest online university

TECH Euromed University is the world's largest online university. We are the largest educational institution, with the best and widest digital educational catalog, one hundred percent online and covering most areas of knowledge. We offer the largest selection of our own degrees and accredited online undergraduate and postgraduate degrees. In total, more than 14,000 university programs, in ten different languages, making us the largest educational institution in the world.

The official online university of the NBA

TECH Euromed University is the official online university of the NBA. Thanks to our agreement with the biggest league in basketball, we offer our students exclusive university programs, as well as a wide variety of educational resources focused on the business of the league and other areas of the sports industry. Each program is made up of a uniquely designed syllabus and features exceptional guest hosts: professionals with a distinguished sports background who will offer their expertise on the most relevant topics.

Leaders in employability

TECH Euromed University has become the leading university in employability. Ninety-nine percent of its students obtain jobs in the academic field they have studied within one year of completing any of the university's programs. A similar number achieve immediate career enhancement. All this thanks to a study methodology that bases its effectiveness on the acquisition of practical skills, which are absolutely necessary for professional development.

Google Premier Partner

The American technology giant has awarded TECH Euromed University the Google Premier Partner badge. This award, which is only available to 3% of the world's companies, highlights the efficient, flexible and tailored experience that this university provides to students. The recognition not only accredits the maximum rigor, performance and investment in TECH Euromed University's digital infrastructures, but also places this university as one of the world's leading technology companies.

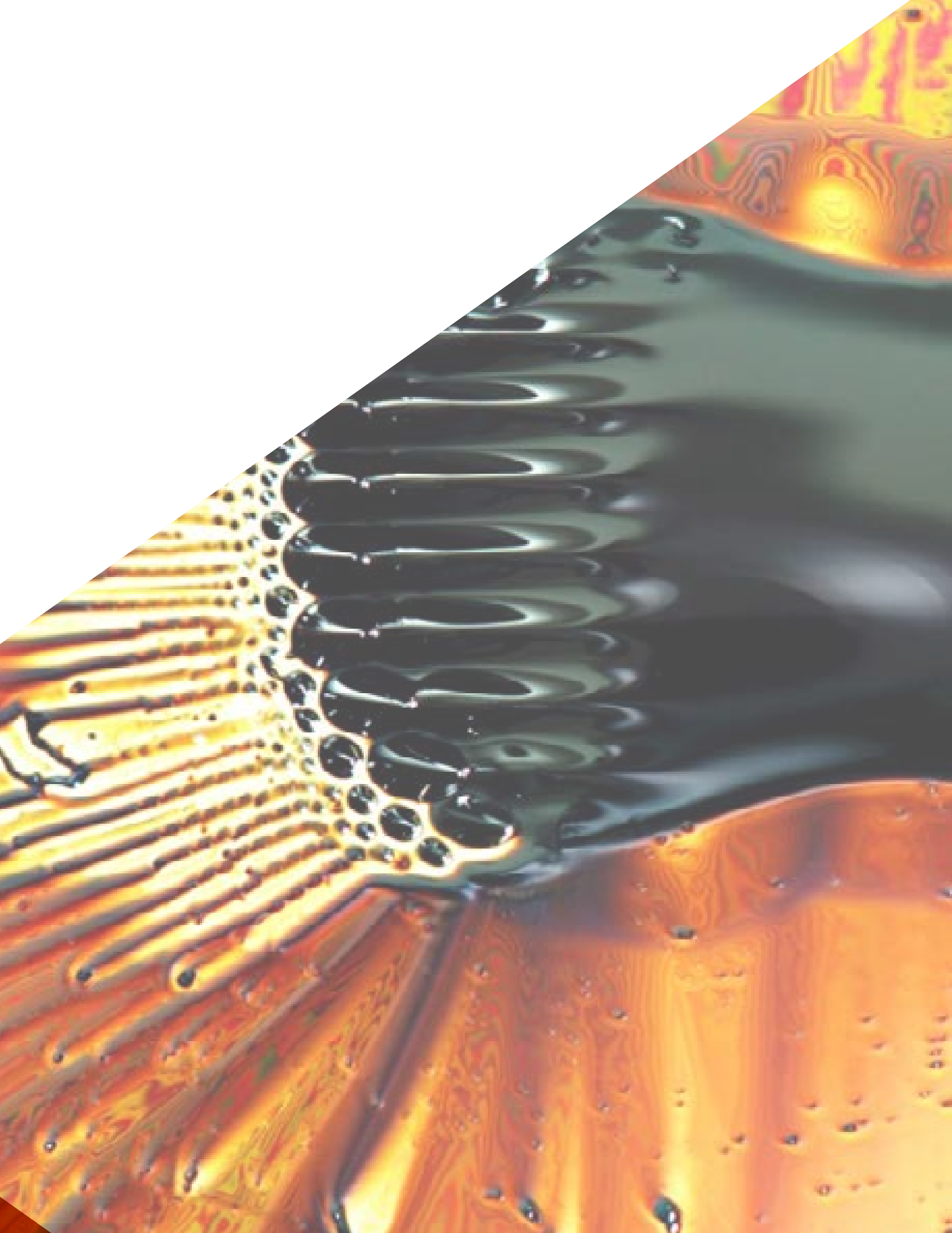
The top-rated university by its students

Students have positioned TECH Euromed University as the world's top-rated university on the main review websites, with a highest rating of 4.9 out of 5, obtained from more than 1,000 reviews. These results consolidate TECH Euromed University as the benchmark university institution at an international level, reflecting the excellence and positive impact of its educational model.

03

Syllabus

This Master's Degree has been designed by an expert team in materials physics, ensuring a rigorous and up-to-date academic pathway through the key areas of the discipline. Throughout the program, students will cover content related to optics, electromagnetism, classical mechanics, statistical physics, electronics, and thermodynamics, among other subjects. The syllabus combines theory and practice, enabling graduates to acquire competencies to analyze, model, and apply solutions in scientific and technological environments. In addition, it incorporates experimental and computational analysis tools that enhance research and professional capabilities in the field of materials.



Understand the transverse nature of plane waves and their behavior in homogeneous and isotropic media"

Module 1. Optics

1.1. Waves: Introduction
- 1.1.1. Wave Motion Equation
- 1.1.2. Plane Waves
- 1.1.3. Spherical Waves
- 1.1.4. Harmonic Solution of the Wave Equation
- 1.1.5. Fourier Analysis

1.2. Wavelet Superposition
- 1.2.1. Superposition of Waves of the Same Frequency
- 1.2.2. Superposition of Waves of Different Frequency
- 1.2.3. Phase Velocity and Group Velocity
- 1.2.4. Superposition of Waves with Perpendicular Electric Vectors

1.3. Electromagnetic Theory of Light
- 1.3.1. Maxwell's Macroscopic Equations
- 1.3.2. The Material Response
- 1.3.3. Energy Relations
- 1.3.4. Electromagnetic Waves
- 1.3.5. Homogeneous and Isotropic Linear Medium
- 1.3.6. Transversality of Plane Waves
- 1.3.7. Energy Transport

1.4. Isotropic Media
- 1.4.1. Reflection and Refraction in Dielectrics
- 1.4.2. Fresnel Formulas
- 1.4.3. Dielectric Media
- 1.4.4. Induced Polarization
- 1.4.5. Classical Lorentz Dipole Model
- 1.4.6. Propagation and Diffusion of a Light Beam

1.5. Geometric Optics
- 1.5.1. Paraxial Approximation
- 1.5.2. Fermat's Principle
- 1.5.3. Trajectory Equation
- 1.5.4. Propagation in Non-Uniform Media

1.6. Image Formation
- 1.6.1. Image Formation in Geometrical Optics
- 1.6.2. Paraxial Optics
- 1.6.3. Abbe's Invariant
- 1.6.4. Increases
- 1.6.5. Centered Systems
- 1.6.6. Focuses and Focal Planes
- 1.6.7. Planes and Main Points
- 1.6.8. Thin Lenses
- 1.6.9. System Coupling

1.7. Optical Instruments
- 1.7.1. The Human Eye
- 1.7.2. Photographic and Projection Instruments
- 1.7.3. Telescopes
- 1.7.4. Near Vision Instruments:: Compound Magnifier and Microscope

1.8. Anisotropic Media
- 1.8.1. Polarization
- 1.8.2. Electrical Susceptibility. Index Ellipsoid
- 1.8.3. Wave Equation in Anisotropic Media
- 1.8.4. Propagation Conditions
- 1.8.5. Refraction in Anisotropic Media
- 1.8.6. Fresnel Construction
- 1.8.7. Construction with the Index Ellipsoid
- 1.8.8. Retarders
- 1.8.9. Absorbent Anisotropic Media

1.9. Interference
- 1.9.1. General Principles and Interference Conditions
- 1.9.2. Wavefront Split Interference
- 1.9.3. Young's Stripes
- 1.9.4. Amplitude Division Interferences
- 1.9.5. Michelson's Interferometer
- 1.9.6. Interference of Multiple Beams Obtained by Amplitude Division
- 1.9.7. Fabry-Perot's Interferometer

1.10. Diffraction
  1.10.1. The Huygens-Fresnel Principle
  1.10.2. Fresnel and Fraunhofer Diffraction
  1.10.3. Fraunhofer's Diffraction through an Aperture
  1.10.4. Limitation of the Resolutive Power of the Instruments
  1.10.5. Fraunhofer Diffraction by Various Apertures
  1.10.6. Double Slit
  1.10.7. Diffraction Grating
  1.10.8. Introduction to Kirchhoff's Scalar Theory

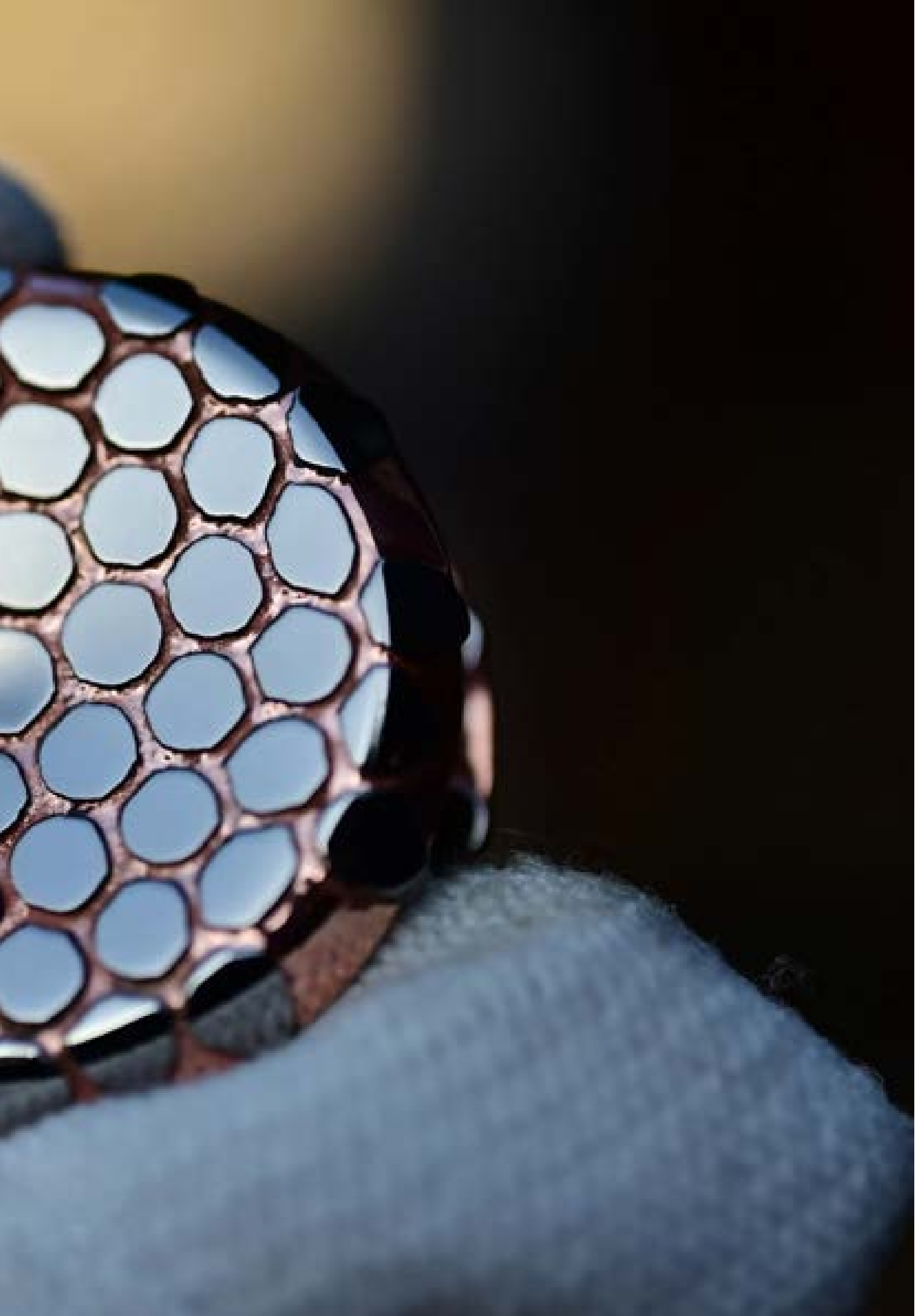
Module 2. Classical Mechanics I

2.1. Kinematics and Dynamics: Review
  2.1.1. Newton's Law
  2.1.2. Reference Systems
  2.1.3. Motion Equation of Particles
  2.1.4. Conservation Theorems
  2.1.5. Particle System Dynamics
2.2. More Newtonian Mechanics
  2.2.1. Conservation Theorems for Particle Systems
  2.2.2. Universal Gravity Law
  2.2.3. Force Lines and Equipotential Surfaces
  2.2.4. Limitations of Newtonian Mechanics
2.3. Kinematics of Rotations
  2.3.1. Mathematical Foundations
  2.3.2. Infinitesimal Rotations
  2.3.3. Angular Velocity and Acceleration
  2.3.4. Rotational Reference Systems
  2.3.5. Coriolis Force
2.4. Rigid Solid Study
  2.4.1. Rigid Solid Kinematics
  2.4.2. Inertia Tensor of Rigid Solids
  2.4.3. Main Inertia Axes
  2.4.4. Steiner and Perpendicular Axes Theorems
  2.4.5. Kinetic Energy of Rotation
  2.4.6. Angular Momentum
2.5. Symmetries and Conservation Laws
  2.5.1. Conservation Theorem of Linear Momentum
  2.5.2. Conservation Theorem of Angular Momentum
  2.5.3. Energy Conservation Theorem
  2.5.4. Classical Mechanic Symmetries: Galileo Group
2.6. Coordinate Systems: Euler Angles
  2.6.1. Coordinate Systems and Changes
  2.6.2. Euler Angles
  2.6.3. Euler Equations
  2.6.4. Stability Around a Major Axis
2.7. Rigid Solid Dynamics Applications
  2.7.1. Spherical Pendulum
  2.7.2. Free Symmetrical Top Movement
  2.7.3. Symmetrical Top Movement with a Fixed Point
  2.7.4. Gyroscopic Effect
2.8. Movement Under Central Forces
  2.8.1. Introduction to Central Force Fields
  2.8.2. Reduced Mass
  2.8.3. Trajectory Equation
  2.8.4. Central Field Orbits
  2.8.5. Centrifugal Energy and Effective Potential
2.9. Kepler's Problem
  2.9.1. Planetary Motion - Kepler's Problem
  2.9.2. Approximate Solution to Kepler's Equation
  2.9.3. Kepler's Laws
  2.9.4. Bertrand's Theorem
  2.9.5. Stability and Perturbation Theory
  2.9.6. 2-Body Problem

2.10. Collisions
- 2.10.1. Elastic and Inelastic Shocks: Introduction
- 2.10.2. Center of Mass Coordinate System
- 2.10.3. Laboratory Coordinate System
- 2.10.4. Elastic Shock Kinematics
- 2.10.5. Particle Dispersion - Rutherford's Dispersion Formula
- 2.10.6. Effective Section

Module 3. Electromagnetism I

3.1. Vector Calculus: Review
- 3.1.1. Vector Operations
  - 3.1.1.1. Scalar Products
  - 3.1.1.2. Vectorial Products
  - 3.1.1.3. Mixed Products
  - 3.1.1.4. Triple Product Properties
- 3.1.2. Vector Transformation
  - 3.1.2.1. Differential Calculus
    - 3.1.2.1.1. Gradient
    - 3.1.2.1.2. Divergence
    - 3.1.2.1.3. Rotational
    - 3.1.2.1.4. Multiplication Rules
- 3.1.3. Integral Calculus
  - 3.1.3.1. Line, Surface and Volume Integrals
  - 3.1.3.2. Fundamental Calculus Theorem
  - 3.1.3.3. Fundamental Gradient Theorem
  - 3.1.3.4. Fundamental Divergence Theorem
  - 3.1.3.5. Fundamental Rotational Theorem
- 3.1.4. Dirac Delta Function
- 3.1.5. Helmholtz Theorem



3.2. Coordinate Systems and Transformations
 3.2.1. Line, Surface and Volume Element
 3.2.2. Cartesian Coordinates
 3.2.3. Polar Coordinates
 3.2.4. Spherical Coordinates
 3.2.5. Cylindrical Coordinates
 3.2.6. Coordinate Change
3.3. Electric Field
 3.3.1. Point Charges
 3.3.2. Coulomb's Law
 3.3.3. Electric Field and Field Lines
 3.3.4. Discrete Charge Distributions
 3.3.5. Continuous Load Distributions
 3.3.6. Divergence and Rotational Electric Field
 3.3.7. Electric Field Flow:Gauss:Theorem
3.4. Electric Potential
 3.4.1. Electric Potential Definition
 3.4.2. Poisson's Equation
 3.4.3. Laplace's Equation
 3.4.4. Potential Charge Distribution Calculation
3.5. Electrostatic Energy
 3.5.1. Electrostatic Work
 3.5.2. Discrete Charge Distribution Energy
 3.5.3. Continuous Charge Distribution Energy
 3.5.4. Electrostatic Equilibrium Conductors
 3.5.5. Induced Charges
3.6. Vacuum Electrostatics
 3.6.1. Laplace's Equation in One, Two and Three Dimensions
 3.6.2. Laplace's Equation - Boundary Conditions and Uniqueness Theorems
 3.6.3. Image Method
 3.6.4. Variable Separation

3.7. Multi-Polar Expansion
  3.7.1. Approximate Potentials Away from the Source
  3.7.2. Multi-Polar Development
  3.7.3. Mono-Polar Term
  3.7.4. Di-Polar Term
  3.7.5. Coordinate Origins in Multi-Pole Expansions
  3.7.6. Electric Field of an Electric Dipole
3.8. Electrostatics in Material Media I
  3.8.1. Dielectric Field
  3.8.2. Dielectric Types
  3.8.3. Vector Displacement
  3.8.4. Gauss's Law in Dielectric Presence
  3.8.5. Boundary Conditions
  3.8.6. Electric Field within Dielectrics
3.9. Electrostatics in Material Media II: Linear Dielectrics
  3.9.1. Electrical Susceptibility
  3.9.2. Electrical Permittivity
  3.9.3. Dielectric Constant
  3.9.4. Dielectric Systems Energy
  3.9.5. Dielectric Forces
3.10. Magnetostatics
  3.10.1. Magnetic Induction Field
  3.10.2. Electric Currents
  3.10.3. Magnetic Field Calculation: Biot and Savart's Law
  3.10.4. Lorentz Force
  3.10.5. Divergence and Rotational Magnetic Field
  3.10.6. Ampere's Law
  3.10.7. Magnetic Vector Potential

Module 4. Classical Mechanics II

4.1. Oscillations
  4.1.1. Simple Harmonic Oscillator
  4.1.2. Damped Oscillator
  4.1.3. Forced Oscillator
  4.1.4. Fourier Series
  4.1.5. Green's Function
  4.1.6. Non-Linear Oscillators
4.2. Coupled Oscillations I
  4.2.1. Introduction
  4.2.2. Coupling of Two Harmonic Oscillators
  4.2.3. Normal Trends
  4.2.4. Weak Coupling
  4.2.5. Forced Vibrations of Coupled Oscillators
4.3. Coupled Oscillations II
  4.3.1. General Theory of Coupled Oscillations
  4.3.2. Normal Coordinates
  4.3.3. Multiple Oscillator Coupling: Continuous Boundary and Vibrating Wire
  4.3.4. Wave Equation
4.4. Special Relativity Theory
  4.4.1. Inertial Reference Systems
  4.4.2. Galileo's Invariance
  4.4.3. Lorentz Transformations
  4.4.4. Relative Velocities
  4.4.5. Linear Relativistic Momentum
  4.4.6. Relativistic Invariants
4.5. Tensor Formalism of Special Relativity
  4.5.1. Quadrivectors
  4.5.2. Quadrimomentum and Quadriposition
  4.5.3. Relativistic Energy
  4.5.4. Relativistic Forces
  4.5.5. Relativistic Particle Collisions
  4.5.6. Particle Disintegrations

4.6. Introduction to Analytical Mechanics
- 4.6.1. Links and Generalized Coordinates
- 4.6.2. Mathematical Tools: Variance Calculation
- 4.6.3. Definition of Action
- 4.6.4. Hamilton Principle: Extreme Action

4.7. Lagrangian Formulation
- 4.7.1. Lagrangian Definition
- 4.7.2. Variance Calculation
- 4.7.3. Euler-Lagrange Equations
- 4.7.4. Conserved Quantities
- 4.7.5. Extension to Non-Holonomous Systems

4.8. Hamiltonian Formulation
- 4.8.1. Phasic Space
- 4.8.2. Legendre Transformations: Hamiltonian
- 4.8.3. Canonical Equations
- 4.8.4. Conserved Quantities

4.9. Analytical Mechanics-Extension
- 4.9.1. Poisson Parentheses
- 4.9.2. Lagrange Multipliers and Bond Forces
- 4.9.3. Liouville Theorem
- 4.9.4. Virial Theorem

4.10. Analytical Relativistic Mechanics and Classical Field Theory
- 4.10.1. Charge Movement in Electromagnetic Fields
- 4.10.2. Lagrangian of a Free relativistic particle
- 4.10.3. Interaction Lagrangian
- 4.10.4. Classical Field Theory: Introduction
- 4.10.5. Classical Electrodynamics

Module 5. Electromagnetism II

5.1. Magnetism in Material Mediums
- 5.1.1. Multi-Polar Development
- 5.1.2. Magnetic Dipole
- 5.1.3. Field Created by a Magnetic Material
- 5.1.4. Magnetic Intensity
- 5.1.5. Types of Magnetic Materials: Diamagnetic, Paramagnetic and Ferromagnetic
- 5.1.6. Border Conditions

5.2. Magnetism in Material Media II
- 5.2.1. Auxiliary Field H
- 5.2.2. Ampere's Law in Magnetized Media
- 5.2.3. Magnetic Susceptibility
- 5.2.4. Magnetic Permeability
- 5.2.5. Magnetic Circuits

5.3. Electrodynamics
- 5.3.1. Ohm's Law
- 5.3.2. Electromotive Force
- 5.3.3. Faraday's Law and its Limitations
- 5.3.4. Mutual Inductance and Self-Inductance
- 5.3.5. Induced Electric Field
- 5.3.6. Inductance
- 5.3.7. Magnetic Field Energy

5.4. Maxwell's Equations
- 5.4.1. Displacement Current
- 5.4.2. Maxwell's Equations in Vacuum and in Material Media
- 5.4.3. Boundary Conditions
- 5.4.4. Solution Uniqueness
- 5.4.5. Electromagnetic Energy
- 5.4.6. Electromagnetic Field Drive
- 5.4.7. Angular Momentum of Electromagnetic Fields

5.5. Conservation Laws
- 5.5.1. Electromagnetic Energy
- 5.5.2. Continuity Equation
- 5.5.3. Poynting's Theorem
- 5.5.4. Newton's Third Law in Electrodynamics

5.6. Electromagnetic Waves: Introduction
- 5.6.1. Wave Motion
- 5.6.2. Wave Equation
- 5.6.3. Electromagnetic Spectrum
- 5.6.4. Plane Waves
- 5.6.5. Sine Waves
- 5.6.6. Boundary Conditions: Reflection and Refraction
- 5.6.7. Polarization

5.7. Electromagnetic Waves in Vacuums
- 5.7.1. Wave Equation for Electric Fields and Magnetic Induction
- 5.7.2. Monochromatic Waves
- 5.7.3. Electromagnetic Wave Energy
- 5.7.4. Electromagnetic Wave Momentum

5.8. Electromagnetic Waves in Material Media
- 5.8.1. Flat Dielectric Waves
- 5.8.2. Flat Conductor Waves
- 5.8.3. Wave Propagation in Linear Media
- 5.8.4. Medium Dispersive
- 5.8.5. Reflection and Refraction

5.9. Waves in Confined Mediums I
- 5.9.1. Maxwell's Guide Equations
- 5.9.2. Dielectric Guides
- 5.9.3. Modes in a Guide
- 5.9.4. Propagation Speed
- 5.9.5. Rectangular Guide

5.10. Waves in Confined Mediums II
- 5.10.1. Resonant Cavities
- 5.10.2. Transmission Lines
- 5.10.3. Transitional Regime
- 5.10.4. Permanent Regime

Module 6. Advanced Thermodynamics

6.1. Formalism of Thermodynamics
- 6.1.1. Laws of Thermodynamics
- 6.1.2. The Fundamental Equation
- 6.1.3. Internal Energy: Euler's Form
- 6.1.4. Gibbs-Duhem Equation
- 6.1.5. Legendre Transformations
- 6.1.6. Thermodynamic Potentials
- 6.1.7. Maxwell's Relations for a Fluid
- 6.1.8. Stability Conditions

6.2. Microscopic Description of Macroscopic Systems I
- 6.2.1. Microstates and Macrostates: Introduction
- 6.2.2. Phase Space
- 6.2.3. Collectivities
- 6.2.4. Microcanonical Collectivity
- 6.2.5. Thermal Equilibrium

6.3. Microscopic Description of Macroscopic Systems II
- 6.3.1. Discrete Systems
- 6.3.2. Statistical Entropy
- 6.3.3. Maxwell-Boltzmann Distribution
- 6.3.4. Pressure
- 6.3.5. Effusion

6.4. Canonical Collectivity
- 6.4.1. Partition Function
- 6.4.2. Ideal Systems
- 6.4.3. Energy Degeneration
- 6.4.4. Behavior of the Monoatomic Ideal Gas at a Potential
- 6.4.5. Energy Equipartition Theorem
- 6.4.6. Discrete Systems

6.5. Magnetic Systems
- 6.5.1. Thermodynamics of Magnetic Systems
- 6.5.2. Classical Paramagnetism
- 6.5.3. ½ Spin Paramagnetism
- 6.5.4. Adiabatic Demagnetization

6.6. Phase Transitions
- 6.6.1. Classification of Phase Transitions
- 6.6.2. Phase Diagrams
- 6.6.3. Clapeyron Equation
- 6.6.4. Vapor-Condensed Phase Equilibrium
- 6.6.5. The Critical Point
- 6.6.6. Ehrenfest's Classification of Phase Transitions
- 6.6.7. Landau's Theory

6.7. Ising's Model
- 6.7.1. Introduction
- 6.7.2. One-Dimensional Chain
- 6.7.3. Open One-Dimensional Chain
- 6.7.4. Mean Field Approximation

6.8. Real Gases
- 6.8.1. Comprehensibility Factor: Virial Development
- 6.8.2. Interaction Potential and Configurational Partition Function.
- 6.8.3. Second Virial Coefficient
- 6.8.4. Van der Waals Equation
- 6.8.5. Lattice Gas
- 6.8.6. Corresponding States Law
- 6.8.7. Joule and Joule-Kelvin Expansions

6.9. Photon Gas
- 6.9.1. Boson Statistics vs. Fermion Statistics
- 6.9.2. Energy Density and Degeneracy of States
- 6.9.3. Planck Distribution
- 6.9.4. Equations of State of a Photon Gas

6.10. Macrocanonical Collectivity
- 6.10.1. Partition Function
- 6.10.2. Discrete Systems
- 6.10.3. Fluctuations
- 6.10.4. Ideal Systems
- 6.10.5. The Monoatomic Gas
- 6.10.6. Vapor-Solid Equilibrium

Module 7. Material Physics

7.1. Materials Science and Solid State
- 7.1.1. Field of Study of Materials Science
- 7.1.2. Classification of Materials According to the Type of Bonding
- 7.1.3. Classification of Materials According to Their Technological Applications
- 7.1.4. Relationship between Structure, Properties and Processing

7.2. Crystalline Structures
- 7.2.1. Order and Disorder: Basic Concepts
- 7.2.2. Crystallography: Fundamental Concepts
- 7.2.3. Review of Basic Crystal Structures: Simple Metallic and Ionic Structures
- 7.2.4. More Complex Crystal Structures (Ionic and Covalent)
- 7.2.5. Structure of Polymers

7.3. Defects in Crystalline Structures
- 7.3.1. Classification of Imperfections
- 7.3.2. Structural Defects
- 7.3.3. Punctual Defects
- 7.3.4. Other Imperfections
- 7.3.5. Dislocations

7.3.6. Interfacial Defects
7.3.7. Extended Defects
7.3.8. Chemical Imperfections
7.3.9. Substitutional Solid Solutions
7.3.10. Interstitial Solid Solutions

7.4. Phase Diagrams
7.4.1. Fundamental Concepts
7.4.1.1. Solubility Limit and Phase Equilibrium
7.4.1.2. Interpretation and Use of Phase Diagrams: Gibbs Phase Rule
7.4.2. 1 Component Phase Diagram
7.4.3. 2 Component Phase Diagram
7.4.3.1. Total Solubility in the Solid State
7.4.3.2. Total Insolubility in the Solid State
7.4.3.3. Partial Solubility in the Solid State
7.4.4. 3 Component Phase Diagram

7.5. Mechanical Properties
7.5.1. Elastic Deformation
7.5.2. Plastic Deformation
7.5.3. Mechanical Testing
7.5.4. Fracture
7.5.5. Fatigue
7.5.6. Fluence

7.6. Electrical Properties
7.6.1. Introduction
7.6.2. Conductivity. Conductors
7.6.3. Semiconductors
7.6.4. Polymers
7.6.5. Electrical Characterization
7.6.6. Insulators
7.6.7. Conductor-Insulator Transition
7.6.8. Dielectrics
7.6.9. Dielectric Phenomena
7.6.10. Dielectric Characterization
7.6.11. Materials of Technological Interest

7.7. Magnetic Properties
7.7.1. Origin of Magnetism
7.7.2. Materials with Magnetic Dipole Moment
7.7.3. Types of Magnetism
7.7.4. Local Field
7.7.5. Diamagnetism
7.7.6. Paramagnetism
7.7.7. Ferromagnetism
7.7.8. Antiferromagnetism
7.7.9. Ferrimagnetism

7.8. Magnetic Properties II
7.8.1. Domains
7.8.2. Hysteresis
7.8.3. Magnetostriction
7.8.4. Materials of Technological Interest: Magnetically Soft and Hard
7.8.5. Characterization of Magnetic Materials

7.9. Thermal Properties
7.9.1. Introduction
7.9.2. Heat Capacity
7.9.3. Thermal Conduction
7.9.4. Expansion and Contraction
7.9.5. Thermoelectric Phenomena
7.9.6. Magnetocaloric Effect
7.9.7. Characterization of Thermal Properties

7.10. Optical Properties: Light and Matter
7.10.1. Absorption and Re-Emission
7.10.2. Light Sources
7.10.3. Energy Conversion
7.10.4. Optical Characterization
7.10.5. Microscopy Techniques
7.10.6. Nanostructures

Module 8. Analog and Digital Electronics

8.1. Circuit Analysis
- 8.1.1. Element Constraints
- 8.1.2. Connection Constraints
- 8.1.3. Combined Constraints
- 8.1.4. Equivalent Circuits
- 8.1.5. Voltage and Current Division
- 8.1.6. Circuit Reduction

8.2. Analog Systems
- 8.2.1. Kirchoff's Laws
- 8.2.2. Thévenin's Theorem
- 8.2.3. Norton's Theorem
- 8.2.4. Introduction to Semiconductor Physics

8.3. Devices and Characteristic Equations
- 8.3.1. Diode
- 8.3.2. Bipolar Transistors (BJTs) and MOSFETs
- 8.3.3. Pspice Model
- 8.3.4. Characteristic Curves
- 8.3.5. Regions of Operation

8.4. Amplifiers
- 8.4.1. Amplifier Operation
- 8.4.2. Equivalent Circuits of Amplifiers
- 8.4.3. Feedback
- 8.4.4. Frequency Domain Analysis

8.5. Amplification Stages
- 8.5.1. BJT and MOSFET Amplifier Function
- 8.5.2. Polarization
- 8.5.3. Equivalent Small-Signal Model
- 8.5.4. Single-Stage Amplifiers
- 8.5.5. Frequency Response
- 8.5.6. Connection of Amplifier Stages in Cascade
- 8.5.7. Differential Torque
- 8.5.8. Current Mirrors and Application as Active Loads

8.6. Operational Amplifier and Applications
- 8.6.1. Ideal Operational Amplifier
- 8.6.2. Deviations from Ideality
- 8.6.3. Sinusoidal Oscillators
- 8.6.4. Comparators and Relaxation Oscillators

8.7. Logic Functions and Combinational Circuits
- 8.7.1. Information Representation in Digital Electronics
- 8.7.2. Boolean Algebra
- 8.7.3. Simplification of Logic Functions
- 8.7.4. Two-Level Combinational Structures
- 8.7.5. Combinational Functional Modules

8.8. Sequential Systems
- 8.8.1. Concept of Sequential System
- 8.8.2. Latches, Flip-Flops and Registers
- 8.8.3. State Tables and State Diagrams: Moore and Mealy Models
- 8.8.4. Synchronous Sequential Systems Implementation
- 8.8.5. General Structure of a Computer

8.9. MOS Digital Circuits
- 8.9.1. Investors
- 8.9.2. Static and Dynamic Parameters
- 8.9.3. Combinational MOS Circuits
  - 8.9.3.1. Step Transistor Logic
  - 8.9.3.2. Implementing Latches and Flip-Flops

8.10. Bipolar and Advanced Technology Digital Circuits
- 8.10.1. BJT Switch. BTJ Digital Circuits
- 8.10.2. TTL Transistor-Transistor Logic Circuits
- 8.10.3. Characteristic Curves of a Standard TTL
- 8.10.4. Emitter-Coupled Logic Circuits ECL
- 8.10.5. Digital Circuits with BiCMOS

Module 9. Statistical Physics

9.1. Stochastic Processes
 9.1.1. Introduction
 9.1.2. Brownian Motion
 9.1.3. Random Walk
 9.1.4. Langevin Equation
 9.1.5. Fokker-Planck Equation
 9.1.6. Brownian Engines
9.2. Review of Statistical Mechanics
 9.2.1. Collectivities and Postulates
 9.2.2. Microcanonical Collectivity
 9.2.3. Canonical Collectivity
 9.2.4. Discrete and Continuous Energy Spectra
 9.2.5. Classical and Quantum Limits. Thermal Wavelength
 9.2.6. Maxwell-Boltzmann Statistics
 9.2.7. Energy Equipartition Theorem
9.3. Ideal Gas of Diatomic Molecules
 9.3.1. The Problem of Specific Heats in Gases
 9.3.2. Internal Degrees of Freedom
 9.3.3. Contribution of Each Degree of Freedom to the Heat Capacity
 9.3.4. Polyatomic Molecules
9.4. Magnetic Systems
 9.4.1. Spin Systems ½
 9.4.2. Quantum Paramagnetism
 9.4.3. Classical Paramagnetism
 9.4.4. Superparamagnetism
9.5. Biological Systems
 9.5.1. Biophysics
 9.5.2. DNA Denaturation
 9.5.3. Biological Membranes
 9.5.4. Myoglobin Saturation Curve. Langmuir Isotherm
9.6. Systems with Interaction
 9.6.1. Solids, Liquids, Gases
 9.6.2. Magnetic Systems. Ferro-Paramagnetic Transition
 9.6.3. Weiss Model
 9.6.4. Landau Model
 9.6.5. Ising's Model
 9.6.6. Critical Points and Universality
 9.6.7. Monte Carlo Method. Metropolis Algorithm
9.7. Quantum Ideal Gas
 9.7.1. Distinguishable and Indistinguishable Particles
 9.7.2. Microstates in Quantum Statistical Mechanics
 9.7.3. Calculation of the Macrocanonical Partition Function in an Ideal Gas
 9.7.4. Quantum Statistics: Bose-Einstein and Fermi-Dirac Statistics
 9.7.5. Ideal Gases of Bosons and Fermions
9.8. Ideal Boson Gas
 9.8.1. Photons. Black Body Radiation
 9.8.2. Phonons. Heat Capacity of the Crystal Lattice
 9.8.3. Bose-Einstein Condensation
 9.8.4. Thermodynamic Properties of Bose-Einstein Gas
 9.8.5. Critical Temperature and Density
9.9. Ideal Gas for Fermions
 9.9.1. Fermi-Dirac Statistics
 9.9.2. Electron Heat Capacity
 9.9.3. Fermion Degeneracy Pressure
 9.9.4. Fermi Function and Temperature
9.10. Elementary Kinetic Theory of Gases
 9.10.1. Dilute Gas in Equilibrium
 9.10.2. Transport Coefficients
 9.10.3. Thermal Conductivity of the Crystalline Lattice and Electrons
 9.10.4. Gaseous Systems Composed of Moving Molecules

Module 10. Fluid Mechanics

10.1. Introduction to Fluid Physics
- 10.1.1. No-Slip Condition
- 10.1.2. Classification of Flows
- 10.1.3. Control System and Volume
- 10.1.4. Fluid Properties
  - 10.1.4.1. Density
  - 10.1.4.2. Specific Gravity
  - 10.1.4.3. Vapor Pressure
  - 10.1.4.4. Cavitation
  - 10.1.4.5. Specific Heat
  - 10.1.4.6. Compressibility
  - 10.1.4.7. Speed of Sound
  - 10.1.4.8. Viscosity
  - 10.1.4.9. Surface Tension

10.2. Fluid Statics and Kinematics
- 10.2.1. Pressure
- 10.2.2. Pressure Measuring Devices
- 10.2.3. Hydrostatic Forces on Submerged Surfaces
- 10.2.4. Buoyancy, Stability and Motion of Rigid Solids
- 10.2.5. Lagrangian and Eulerian Description
- 10.2.6. Flow Patterns
- 10.2.7. Kinematic Tensors
- 10.2.8. Vorticity
- 10.2.9. Rotationality
- 10.2.10. Reynolds Transport Theorem

10.3. Bernoulli and Energy Equations
- 10.3.1. Conservation of Mass
- 10.3.2. Mechanical Energy and Efficiency
- 10.3.3. Bernoulli's Equation
- 10.3.4. General Energy Equation
- 10.3.5. Stationary Flow Energy Analysis

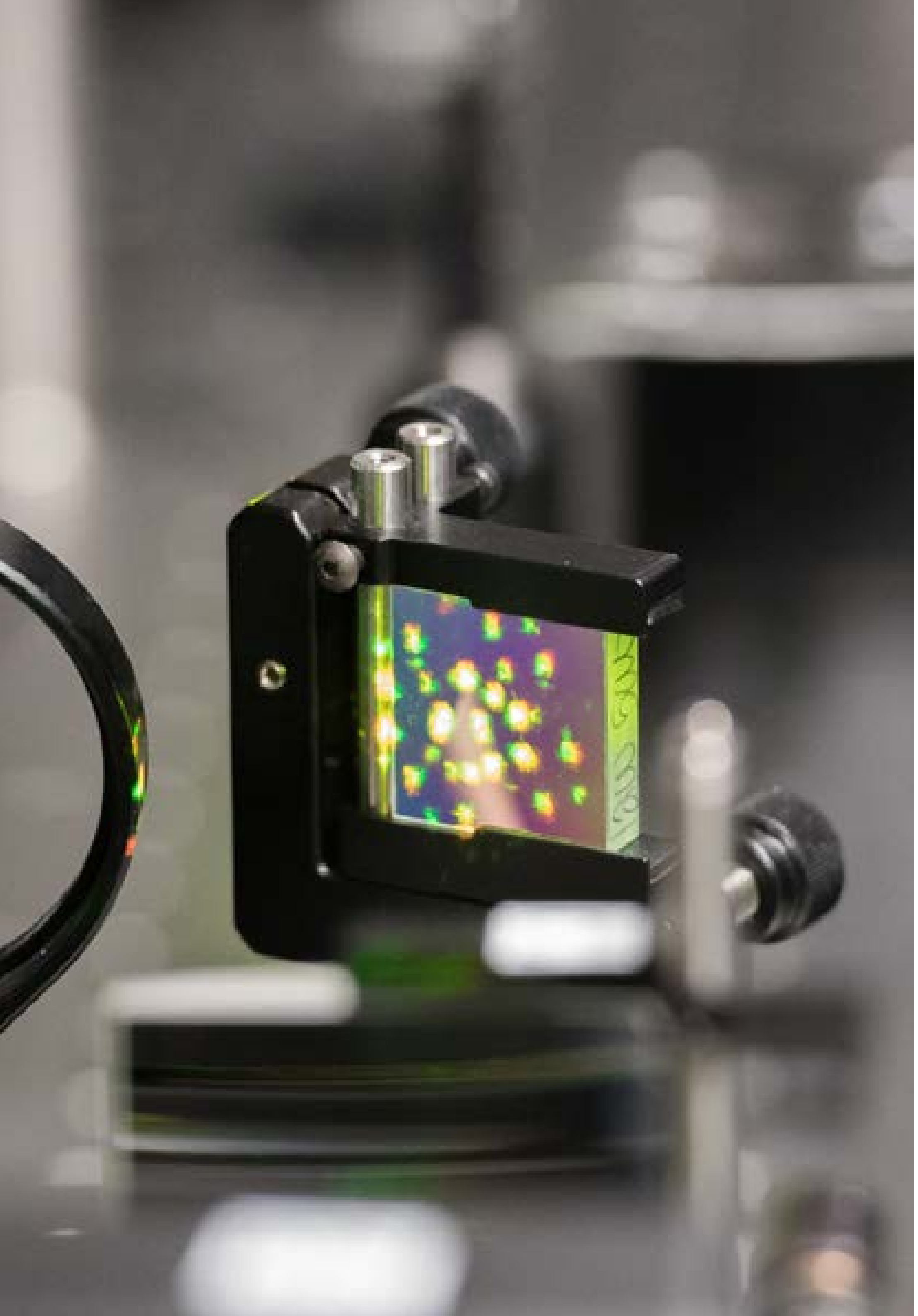
10.4. Fluid Analysis
- 10.4.1. Conservation of Linear Momentum Equations
- 10.4.2. Conservation of Angular Momentum Equations
- 10.4.3. Dimensional Homogeneity
- 10.4.4. Variable Repetition Method
- 10.4.5. Buckingham's Pi Theorem

10.5. Flow in Pipes
- 10.5.1. Laminar and Turbulent Flow
- 10.5.2. Inlet Region
- 10.5.3. Minor Losses
- 10.5.4. Networks

10.6. Differential Analysis and Navier-Stokes Equations
- 10.6.1. Conservation of Mass
- 10.6.2. Current Function
- 10.6.3. Cauchy Equation
- 10.6.4. Navier-Stokes Equation
- 10.6.5. Dimensionless Navier-Stokes Equations of Motion
- 10.6.6. Stokes Flow
- 10.6.7. Inviscid Flow
- 10.6.8. Irrotational Flow
- 10.6.9. Boundary Layer Theory. Clausius Equation

10.7. External Flow
- 10.7.1. Drag and Lift
- 10.7.2. Friction and Pressure
- 10.7.3. Coefficients
- 10.7.4. Cylinders and Spheres
- 10.7.5. Aerodynamic Profiles

10.8. Compressible Flow
  10.8.1. Stagnation Properties
  10.8.2. One-Dimensional Isentropic Flow
  10.8.3. Nozzles
  10.8.4. Shock Waves
  10.8.5. Expansion Waves
  10.8.6. Rayleigh Flow
  10.8.7. Fanno Flow
10.9. Open Channel Flow
  10.9.1. Classification
  10.9.2. Froude Number
  10.9.3. Wave Speed
  10.9.4. Uniform Flow
  10.9.5. Gradually Varying Flow
  10.9.6. Rapidly Varying Flow
  10.9.7. Hydraulic Jump
10.10. Non-Newtonian Fluids
  10.10.1. Standard Flows
  10.10.2. Material Functions
  10.10.3. Experiments
  10.10.4. Generalized Newtonian Fluid Model
  10.10.5. Generalized Linear Viscoelastic Fluid Model
  10.10.6. Advanced Constitutive Equations and Rheometry



Analyze the transport of electromagnetic energy and how it is conserved across different physical media"

04

Teaching Objectives

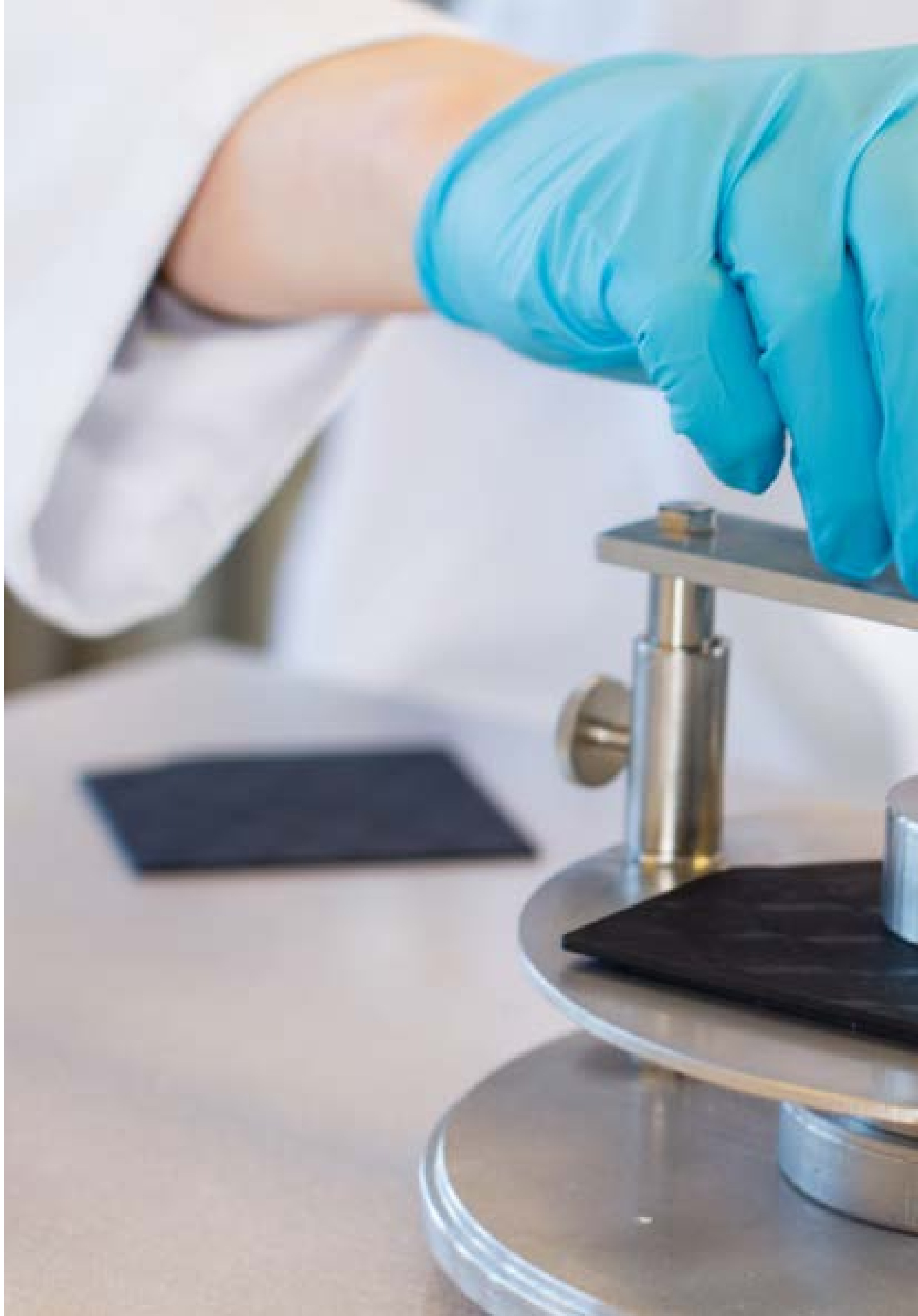
This Master's Degree has been designed to ensure that students acquire advanced competencies in materials physics from a multidisciplinary approach. To this end, the degree program addresses subjects ranging from optics and classical mechanics to electronics and statistical physics, also incorporating content on relativistic dynamics, thermodynamics, and fluid mechanics. In this way, the teaching objectives of this Postgraduate Diploma ensure that graduates develop skills to apply experimental techniques, model complex physical systems, and understand the behavior of materials at both microscopic and macroscopic levels in highly demanding academic, technological, and industrial environments.

Study the principles of reflection and refraction in dielectric media through an applied and rigorous approach"

General Objectives

- Deepen research in relativistic dynamics
- Understand the most relevant experimental techniques in Materials Physics
- Implement the use of experimental techniques to solve problems in materials science
- Understand the relationship between optics and other areas of physics

"Explore the classical Lorentz dipole model to understand the interaction between light and matter"



Specific Objectives

Module 1. Optics
- Deepen knowledge of the basic principles of geometrical optics
- Understand the physical principles on which the most common optical instruments are based
- Understand and analyze optical phenomena present in everyday life
- Apply the concepts of optics to physical problem solving related to optics

Module 2. Classical Mechanics I
- Consolidate knowledge of Newtonian mechanics
- Solve central force problems using rotational symmetry
- Address systems of particles and rigid bodies
- Study rigid body rotations, the inertia tensor, and Euler's equations

Module 3. Electromagnetism I
- Acquire basic knowledge of the electric field and its properties
- Apply vector analysis to the study of the electric field
- Achieve a basic understanding of the magnetic induction field
- Understand the behavior of electrostatics both in vacuum and in material media

Module 4. Classical Mechanics II
- Develop systems of particles and simple and coupled oscillators
- Understand and use the mathematical tools of four-vectors
- Learn the Lagrangian and Hamiltonian formalisms
- Solve classical mechanics problems using Newtonian, Lagrangian, and Hamiltonian approaches

Module 5. Electromagnetism II

- Acquire basic knowledge of the magnetic field and its properties
- Understand magnetostatics both in material media and in vacuum
- Understand conservation laws in electromagnetism and apply them to problem solving
- Distinguish Maxwell's equations and compute solutions such as electromagnetic waves and their propagation

Module 6. Advanced Thermodynamics

- Advance in the principles of thermodynamics
- Understand the concept of ensembles and distinguish between different types, identifying which ensemble is most useful for the study of a given system depending on the type of thermodynamic system
- Understand the basic notions of the Ising model
- Understand the difference between bosonic and baryonic statistics

Module 7. Material Physics

- Understand the relationship between materials science and physics, and the applicability of this field to current technology
- Understand the connection between microscopic structure (atomic, nanometric, or micrometric) and the macroscopic properties of materials, as well as their interpretation in physical terms

Module 8. Analog and Digital Electronics

- Understand the operation of linear, nonlinear, and digital electronic circuits
- Understand the different methods for specifying and implementing digital systems
- Identify different electronic devices and understand their operation
- Master MOS digital circuits

Module 9. Statistical Physics

- Deepen knowledge of ensemble theory and apply it to the study of ideal and interacting systems, including phase transitions and critical phenomena
- Become familiar with elementary kinetic theory of transport processes and apply it to dilute gases and quantum gases

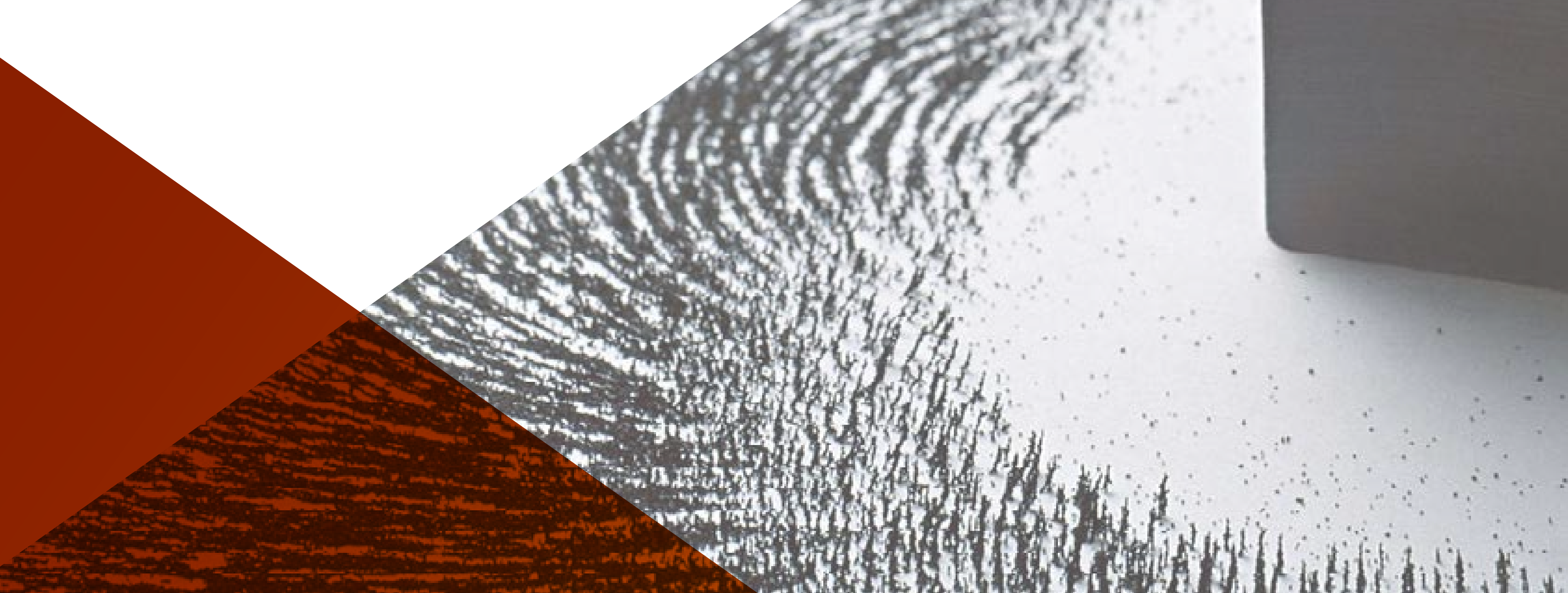
Module 10. Fluid Mechanics

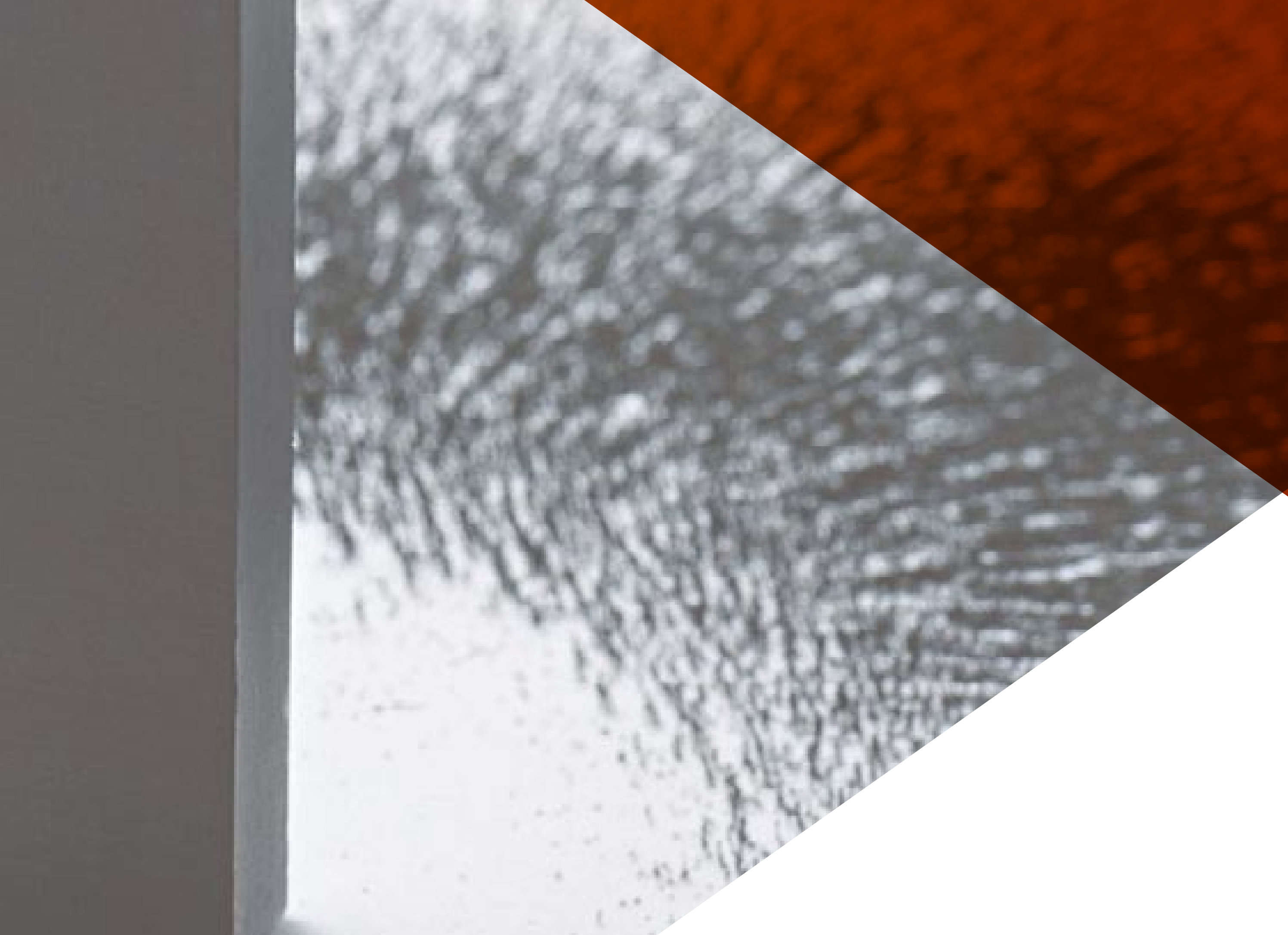
- Understand the general concepts of fluid physics and solve related problems
- Understand the basic characteristics of fluids and their behavior under different conditions
- Distinguish constitutive equations
- Gain confidence in the use of the Navier–Stokes equations

05

Career Opportunities

Thanks to its multidisciplinary approach, materials physics opens up a wide range of professional opportunities in key sectors such as nanotechnology, energy, advanced electronics, and the aerospace industry. In addition, the development of new sustainable and functional materials is currently a strategic priority for companies and research institutes. As a result, this field has become one of the most in demand by laboratories, R&D centers, and technology companies. Consequently, those who master its fundamentals and applications possess a highly competitive profile to lead innovation processes in applied science and industrial development.





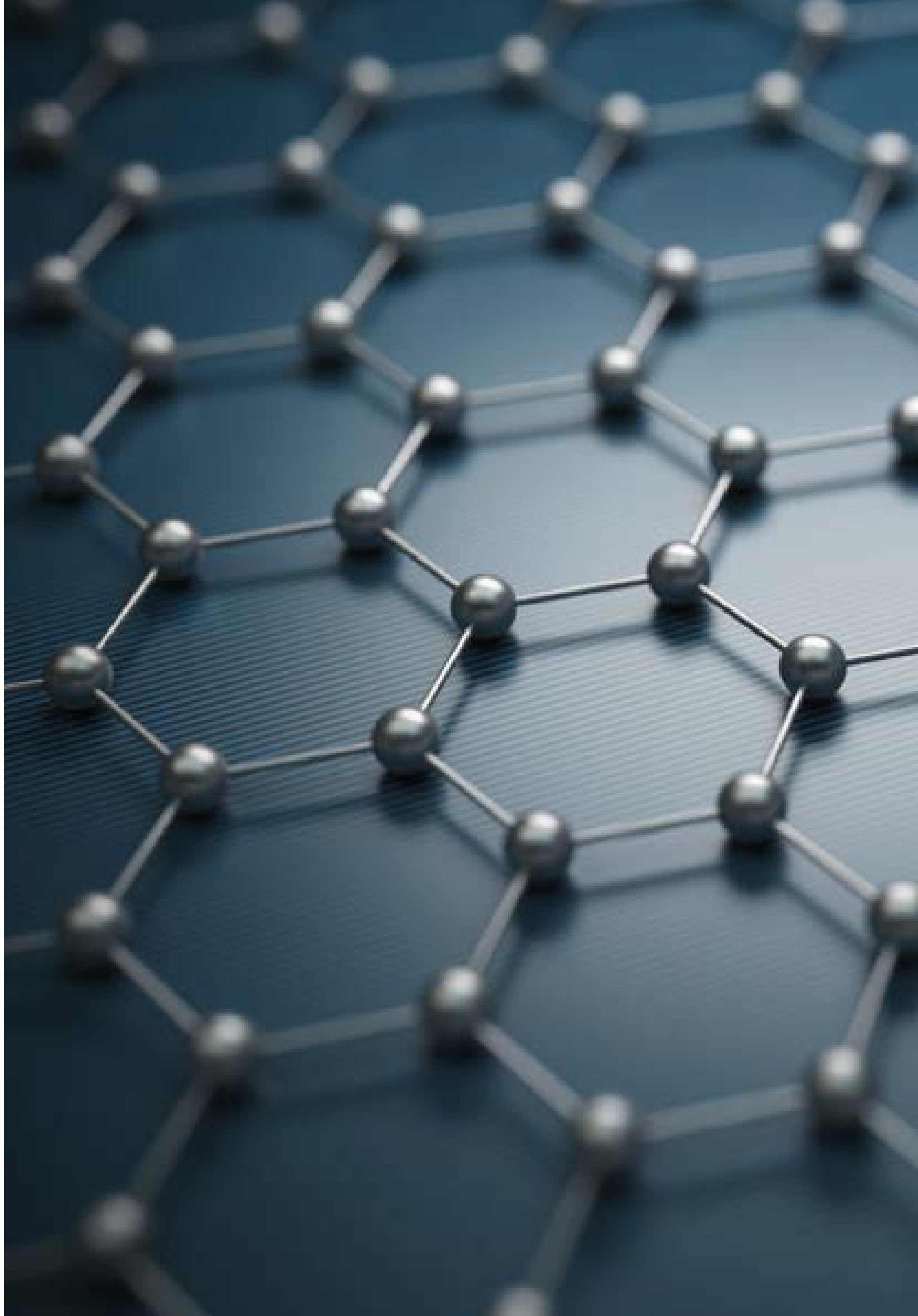
You will understand the behavior of materials at different scales and will be able to actively participate in the development of new materials with high technological impact"

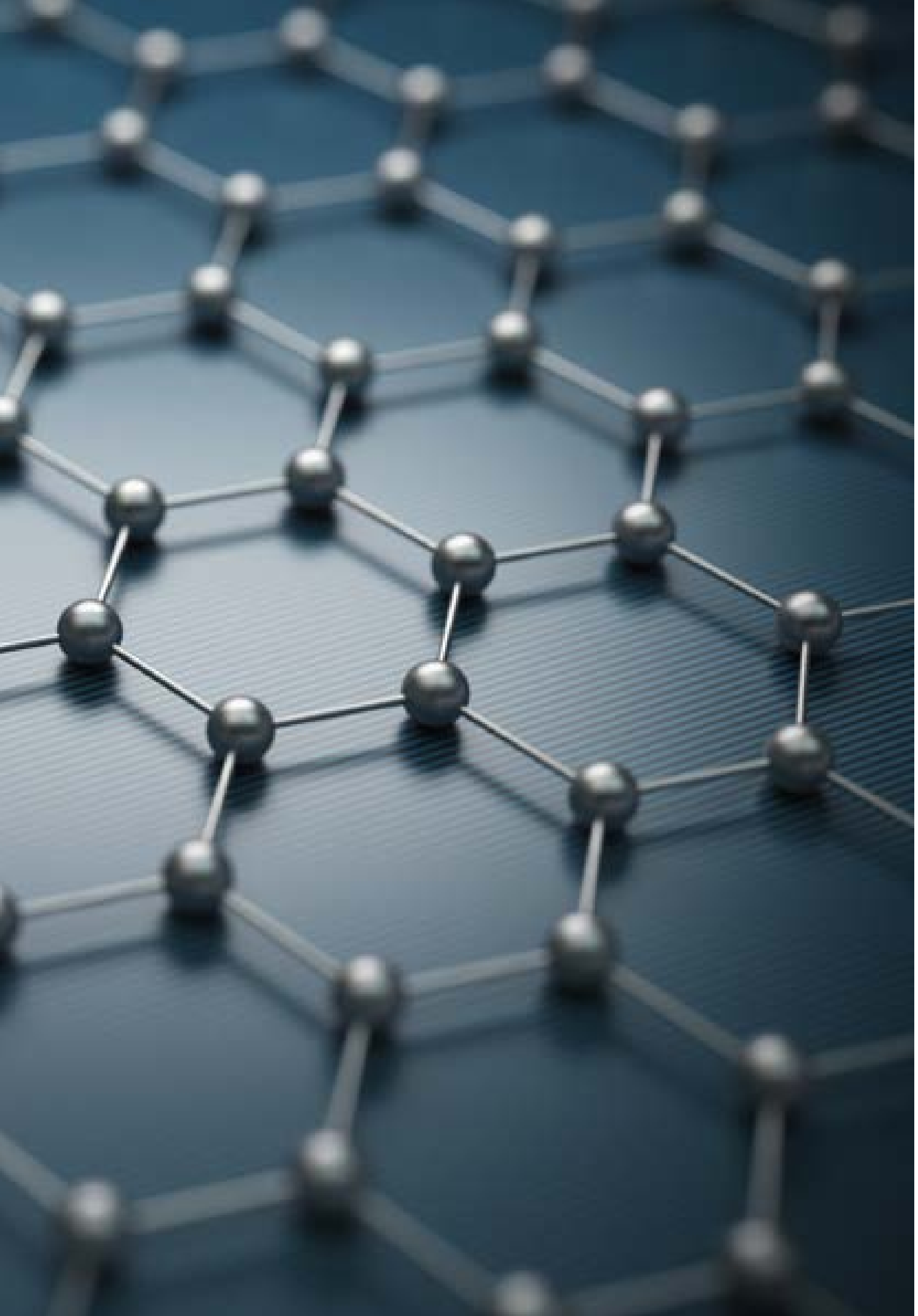
Graduate Profile

Graduates of this Master's Degree from TECH will be highly qualified professionals in the analysis, design, and application of solutions in the field of materials physics. They will have a comprehensive and advanced perspective on optics, classical mechanics, electromagnetism, electronics, statistical physics, and thermodynamics. They will be prepared to select, optimize, and develop materials with specific properties, mastering experimental, analytical, and computational techniques. This professional will be able to lead technological innovation projects, participate in cutting-edge research, and contribute to scientific and industrial advancement in applied physics.

You will be able to perform with excellence in the study and development of new materials, providing solutions to global technological challenges.

- **Physical Analysis and Material Behavior:** Ability to understand and interpret the mechanical, thermal, electrical, and optical behavior of materials, both classical and advanced
- **Application of Scientific Methods:** Mastery of experimental techniques and mathematical modeling for the study, design, and optimization of materials under different conditions
- **Innovation and Technological Development:** Ability to participate in development and innovation processes involving materials applied to industrial, scientific, or energy sectors
- **Critical Reasoning and Problem Solving:** Competence to identify, formulate, and solve complex physical problems using a rigorous theoretical foundation and modern computational tools





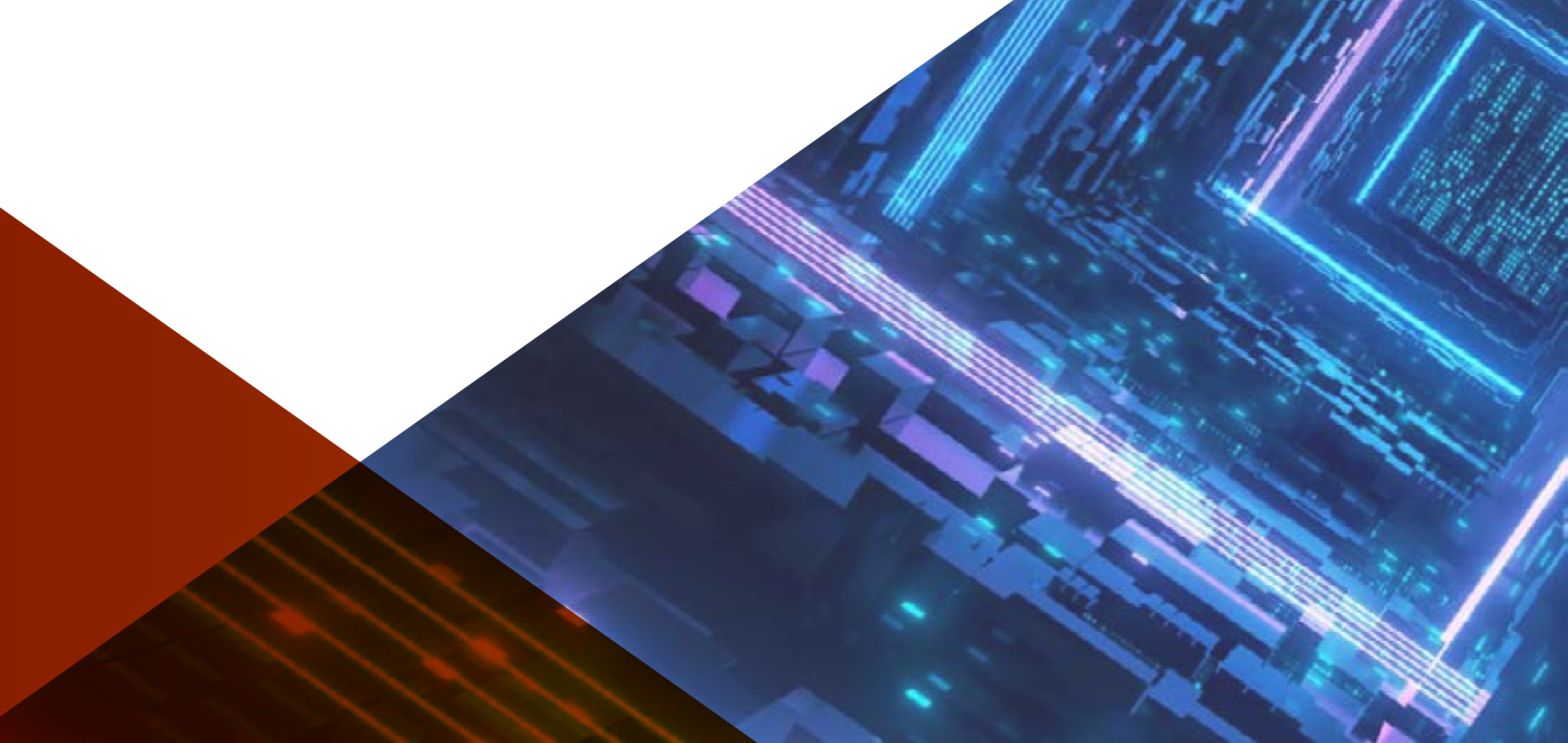
After completing the professional training program, you will be able to apply your knowledge and skills in the following positions:

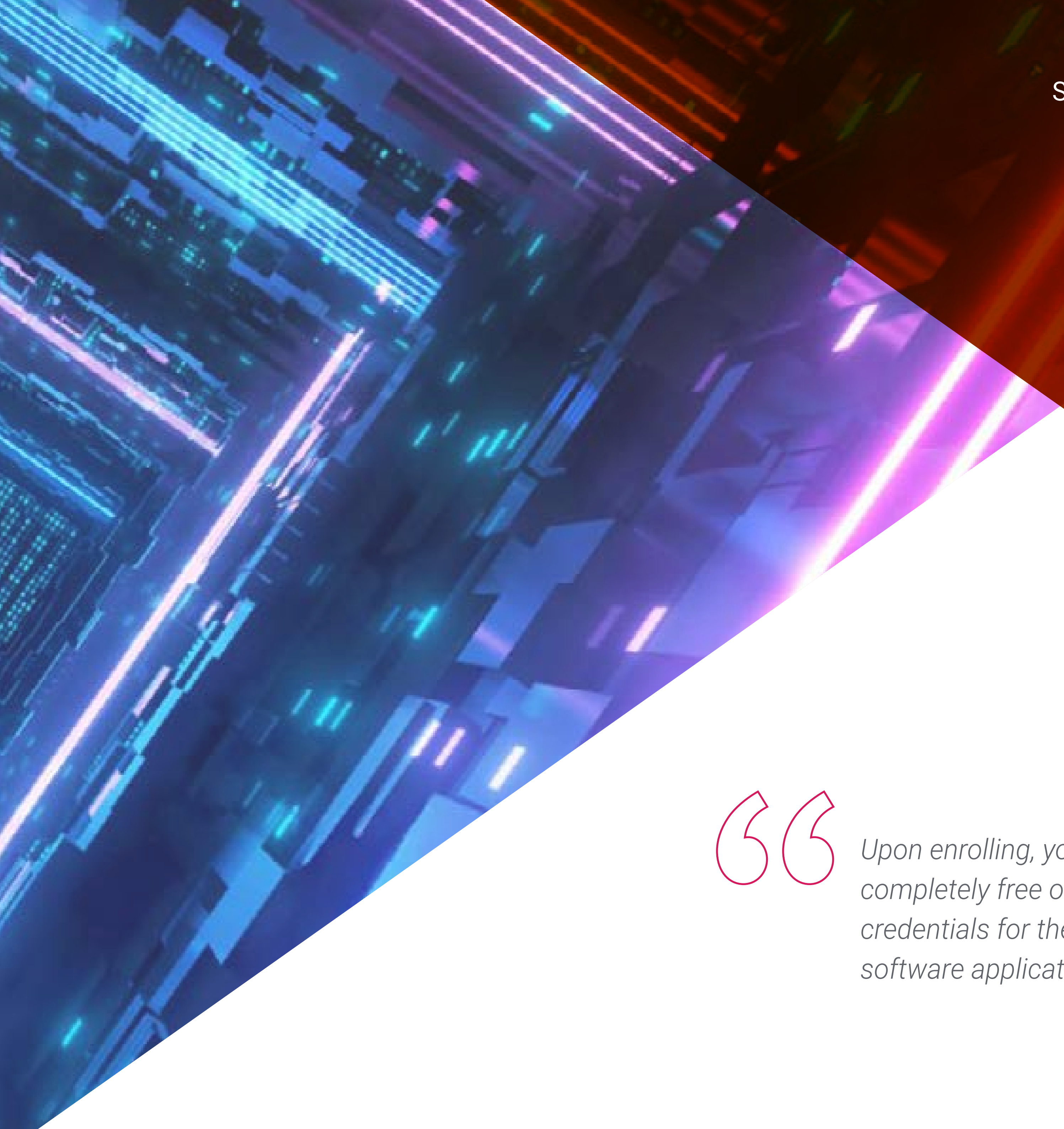
1. **Materials Science Researcher:** Responsible for developing scientific projects focused on the study and creation of new materials with industrial, technological, or energy applications
2. **Materials Characterization Specialist:** Responsible for applying optical, thermal, electrical, and magnetic techniques for material analysis in research laboratories or quality control environments
3. **Advanced Materials Technology Consultant:** Advisor to companies or R&D centers seeking to implement solutions based on innovative materials to optimize processes or products
4. **Electronic and Optoelectronic Device Developer:** Professional qualified to integrate knowledge of electronics, optics, and solid-state physics in the design of functional devices
5. **Simulation and Physical Modeling Analyst:** Specialist in the use of computational tools to predict the behavior of complex physical systems and materials-related processes
6. **Thermodynamics and Fluid Mechanics Engineer:** Professional with skills to apply physical principles in sectors such as energy, aeronautics, automotive engineering, or process industries
7. **Academic Lecturer and Researcher in Applied Physics:** Capable of leading educational projects, delivering specialized teaching, and fostering innovation in universities or scientific centers
8. **Materials Testing Laboratory Supervisor:** Responsible for leading technical teams and managing analysis procedures in industrial or institutional environments

06

Software Licenses Included

TECH is a leading reference in the academic world for combining the latest technology with teaching methodologies to enhance the teaching-learning process. To achieve this, it has established a network of alliances that allows it to access the most advanced software tools used in the professional world.





Upon enrolling, you will receive, completely free of charge, academic credentials for the following professional software applications"

TECH has established a network of professional alliances with the leading providers of software applied to various professional fields. These alliances allow TECH to access hundreds of software applications and licenses, making them available to its students.

The academic software licenses will allow students to use the most advanced applications in their professional field, so they can become familiar with them and master their use without incurring additional costs. TECH will be responsible for managing the licensing process so that students may use them without limitations throughout the entire duration of the Master's Degree in Materials Physics, completely free of charge.

TECH will provide free access to the following software applications:

Google Career Launchpad

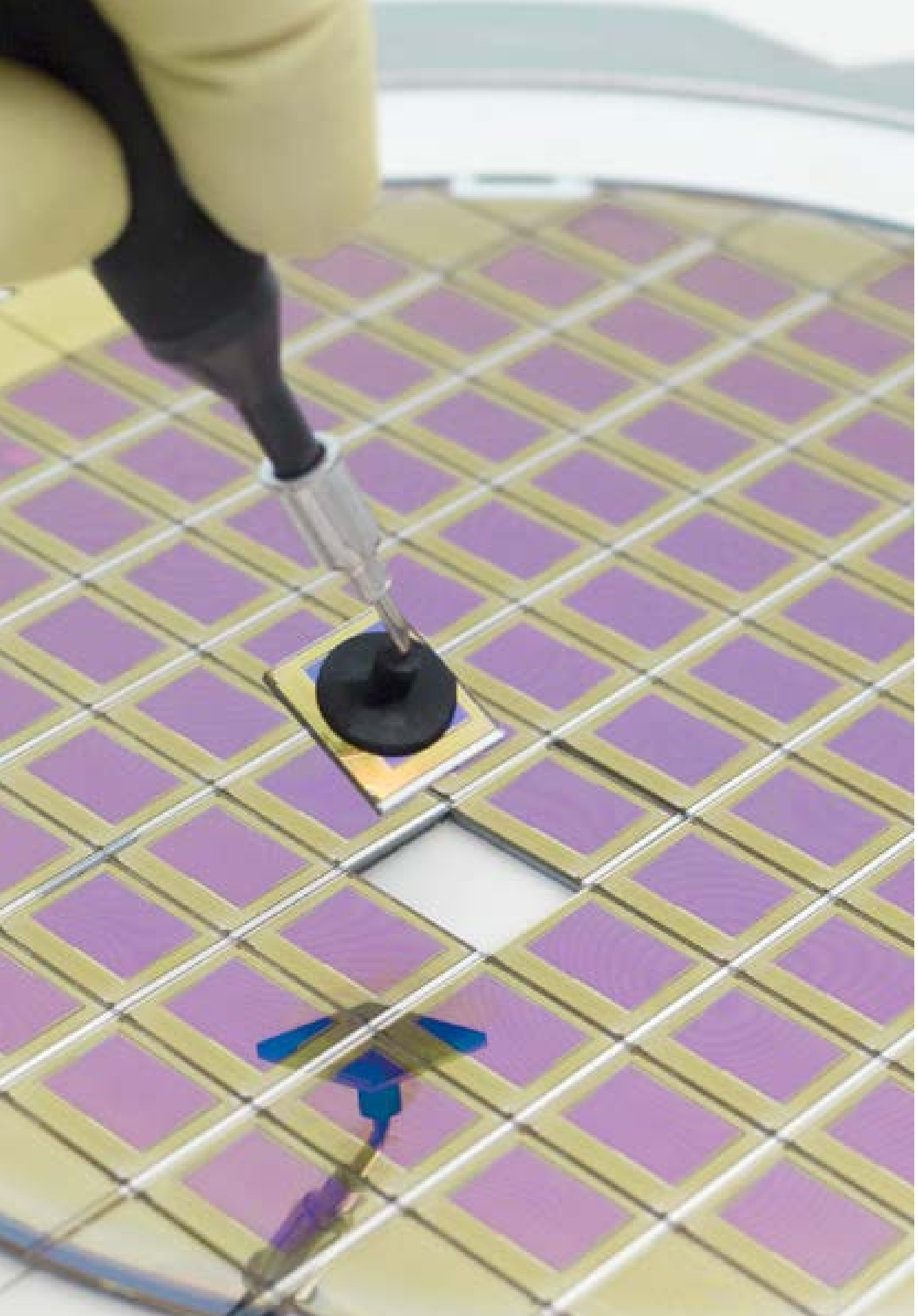
Google Career Launchpad is a solution for developing digital skills in technology and data analysis. With an estimated value of **5,000 dollars**, it is included **for free** in TECH's university program, providing access to interactive labs and certifications recognized in the industry.

This platform combines technical training with practical cases, using technologies such as BigQuery and Google AI. It offers simulated environments to work with real data, along with a network of experts for personalized guidance.

Key Features:

- **Specialized Courses:** Updated content in cloud computing, machine learning, and data analysis
- **Live Labs:** Hands-on practice with real Google Cloud tools, no additional configuration required
- **Integrated Certifications:** Preparation for official exams with international validity
- **Professional Mentoring:** Sessions with Google experts and technology partners
- **Collaborative Projects:** Challenges based on real-world problems from leading companies

In conclusion, **Google Career Launchpad** connects users with the latest market technologies, facilitating their entry into fields such as artificial intelligence and data science with industry-backed credentials.



Ansys

Ansys is engineering simulation software that models physical phenomena such as fluids, structures, and electromagnetism. With a commercial value of 26,400 euros, it is offered free of charge during the university program at TECH, providing access to cutting-edge technology for industrial design.

This platform excels in its ability to integrate multiphysics analysis into a single environment. It combines scientific precision with automation through APIs, streamlining the iteration of complex prototypes in industries such as aerospace or energy.

Key Features:

- *Integrated multiphysics simulation: analyze structures, fluids, electromagnetism, and thermals in a single environment*
- *Workbench: a unified platform to manage simulations, automate processes, and customize workflows with Python*
- *Discovery: prototype in real-time with simulations accelerated by GPU*
- *Automation: create macros and scripts with APIs in Python, C++, and JavaScript*
- *High Performance: solvers optimized for CPU/GPU and cloud scalability on demand*

In conclusion, Ansys is the ultimate tool to transform ideas into technical solutions, offering power, flexibility, and an unparalleled simulation ecosystem.

07

Study Methodology

TECH is the first university in the world to combine case study methodology with Relearning, a 100% online learning system based on guided repetition.

This innovative pedagogical strategy has been conceived to offer professionals the opportunity to update knowledge and develop skills in an intensive and rigorous way. A learning model that places the student at the center of the academic process and gives them the leading role, adapting to their needs and leaving aside the more conventional methodologies.

TECH prepares you to face new challenges in uncertain environments and achieve success in your career”

The student: the priority of all TECH programs

In TECH's study methodology, the student is the absolute protagonist. The pedagogical tools of each program have been selected taking into account the demands of time, availability and academic rigor that, today, not only students demand but also the most competitive positions in the market.

With TECH's asynchronous educational model, it is the student who chooses the time they spend studying, how they decide to establish their routines and all this from the comfort of the electronic device of their choice. The student will not have to attend live classes, which many times they cannot attend. The learning activities will be done when it is convenient for them. You will always be able to decide when and from where to study.

At TECH you will NOT have in person classes (which you might not be able to attend)"

The most comprehensive academic programs worldwide

TECH is distinguished by offering the most complete academic pathways within the higher education landscape. This level of comprehensiveness is achieved through the development of curricula that not only encompass essential knowledge but also integrate the latest innovations in each area of study.

By being constantly updated, these programs allow students to keep up with market changes and acquire the skills most valued by employers. In this way, those who complete their studies at TECH receive a comprehensive preparation that provides them with a notable competitive advantage to advance in their careers.

And what's more, they will be able to do so from any device, PC, tablet or smartphone.

> *TECH's model is asynchronous, so it allows you to study with your PC, tablet or smartphone wherever you want, whenever you want and for as long as you want"*

Case Studies or Case Method

The case method has been the learning system most used by the best business schools in the world. Developed in 1912 so that law students would not only learn the law based on theoretical content, its function was also to present them with real complex situations. In this way, they could make informed decisions and value judgments about how to solve them. In 1924 it was established as a standard teaching method at Harvard.

With this teaching model, it is the student who builds their professional competence through strategies such as Learning by Doing or Design Thinking, which are used by other renowned institutions such as Yale or Stanford.

This action-oriented method will be applied throughout the entire academic itinerary that the student undertakes with TECH. Students will be confronted with multiple real-life situations and will have to integrate knowledge, research, argue and defend their ideas and decisions. All this with the premise of answering the question of how they would act when facing specific events of complexity in their daily work.

Relearning Method

At TECH, case studies are enhanced with the best 100% online teaching method: Relearning.

This method breaks with traditional teaching techniques to put the student at the center of the equation, providing the best content in different formats. In this way, they are able to review and reiterate the key concepts of each subject and learn to apply them in a real environment.

Along the same lines, and according to multiple scientific researches, repetition is the best way to learn. For this reason, TECH offers between 8 and 16 repetitions of each key concept within the same lesson, presented in a different way, with the objective of ensuring that the knowledge is completely consolidated during the study process.

Relearning will allow you to learn with less effort and more performance, involving you more in your specialization, developing a critical spirit, defending arguments and contrasting opinions: a direct equation to success.

A 100% online Virtual Campus with the best teaching resources

To apply its methodology effectively, TECH focuses on providing graduates with teaching materials in different formats: texts, interactive videos, illustrations and knowledge maps, among others. All of them are designed by qualified teachers who focus their work on combining real cases with the resolution of complex situations through simulation, the study of contexts applied to each professional career and learning based on reiteration, through audios, presentations, animations, images, etc.

The latest scientific evidence in the field of Neurosciences points to the importance of taking into account the place and context where the content is accessed before starting a new learning process. Being able to adjust these variables in a personalized way helps people to remember and store knowledge in the hippocampus for long-term retention. This is a model called Neurocognitive Context-Dependent E-Learning that is consciously applied in this university program.

Furthermore, in order to maximize tutor-student contact, a wide range of communication possibilities are provided, both in real time and deferred (internal messaging, discussion forums, telephone answering service, e-mail contact with the technical secretary, chat and videoconferencing).

Likewise, this very complete Virtual Campus will allow TECH students to organize their study schedules according to their personal availability or work obligations. In this way, they will have global control of the academic content and teaching tools, in accordance with their accelerated professional updating.

The online mode of study of this program will allow you to organize your time and your learning pace, adapting it to your schedule"

The effectiveness of the method is justified by four fundamental achievements:

1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that assess real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.

The university methodology best rated by its students

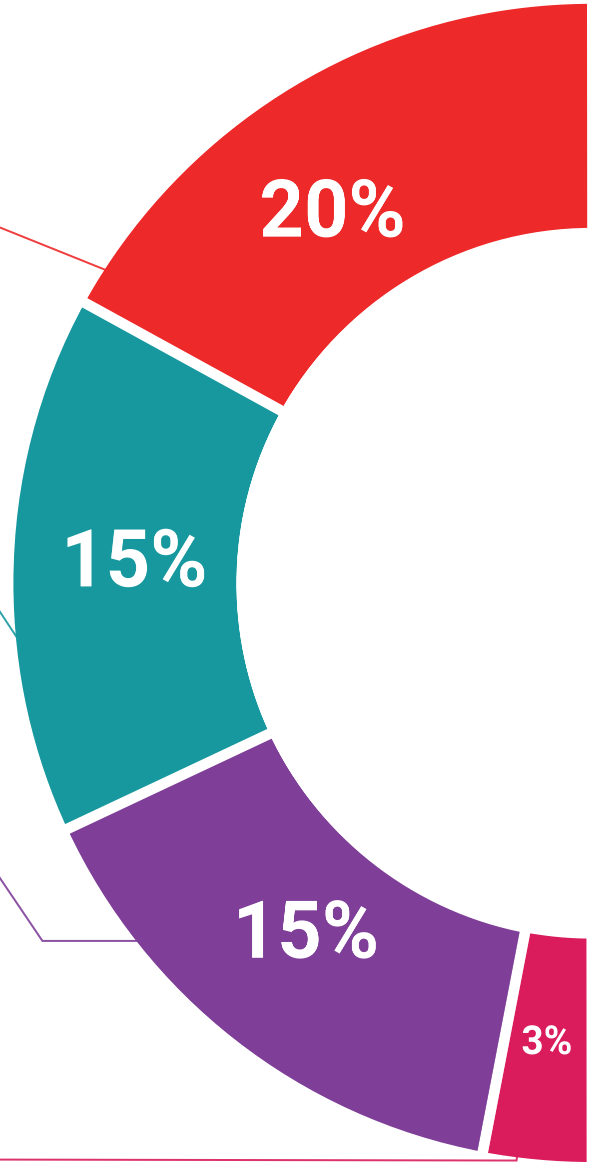
The results of this innovative academic model can be seen in the overall satisfaction levels of TECH graduates.

The students' assessment of the teaching quality, the quality of the materials, the structure of the program and its objectives is excellent. Not surprisingly, the institution has become the top-rated university by its students according to the global score index, obtaining a 4.9 out of 5.

Access the study contents from any device with an Internet connection (computer, tablet, smartphone) thanks to the fact that TECH is up to date with the technological and pedagogical vanguard.

You will be able to learn with the advantages of access to simulated learning environments and the learning by observation approach, that is, the "Learning from an Expert" approach.

Therefore, the best educational materials, thoroughly prepared, will be available in this program:



Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

This content is then adapted in an audiovisual format that will create our way of working online, with the latest techniques that allow us to offer you high quality in all of the material that we provide you with.

Practicing Skills and Abilities

You will carry out activities to develop specific skills and abilities in each thematic area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop within the context of the globalization in which we live.

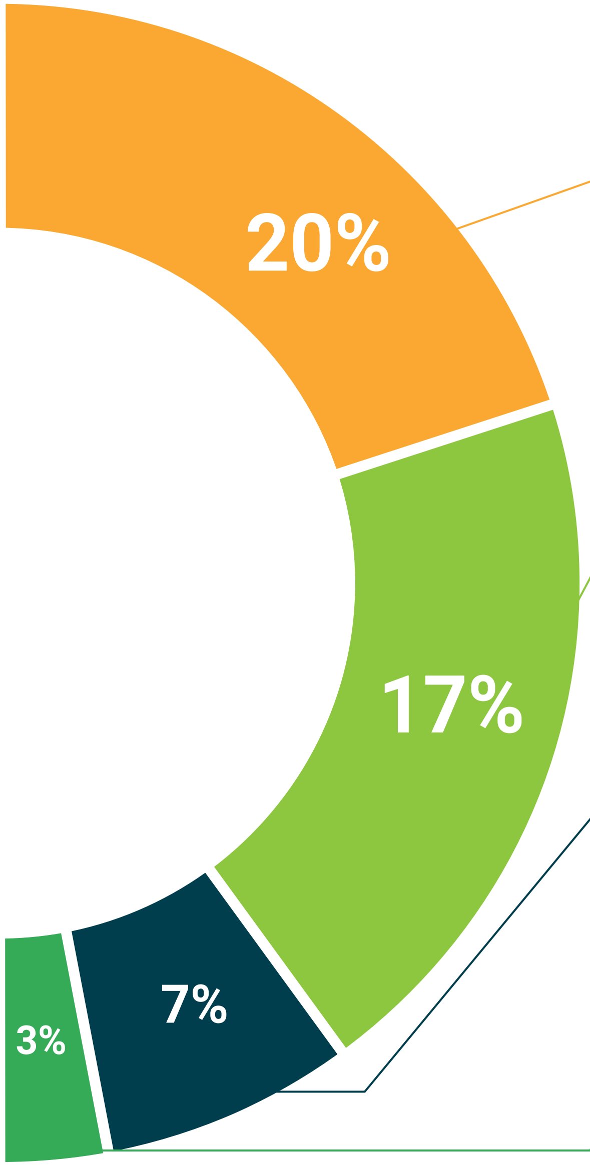
Interactive Summaries

We present the contents in an attractive and dynamic way in multimedia pills that include audio, videos, images, diagrams and concept maps in order to reinforce knowledge.

This unique educational system for the presentation of multimedia content was awarded by Microsoft as "Successful Case in Europe."

Additional Reading

Recent articles, consensus documents, international guidelines... In our virtual library you will have access to everything you need to complete your course.



Case Studies

You will complete a selection of the best case studies in the field. Cases presented, analyzed and tutored by the best specialists in the world.

Testing & Retesting

We periodically evaluate and re-evaluate your knowledge throughout the program. We do this on 3 of the 4 levels of Miller's Pyramid.

Masterclasses

There is scientific evidence suggesting that observing third-party experts can be useful.

Learning from an expert strengthens knowledge and recall, and generates confidence in our future difficult decisions.

Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical and effective way to help students progress in their learning.

08
Certificate

The Master's Degree in Material Physics guarantees students, in addition to the most rigorous and up-to-date education, access to a diploma for the Master's Degree issued by TECH Global University.

Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"

This private qualification will allow you to obtain a diploma for the **Master's Degree in Material Physics** endorsed by **TECH Global University**, the world's largest online university.

TECH Global University, is an official European University publicly recognized by the Government of Andorra ***(official bulletin)***. Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

This private qualification from **TECH Global University** is a European continuing education and professional development program that guarantees the acquisition of competencies in its area of expertise, providing significant curricular value to the student who successfully completes the program.

Title: **Master's Degree in Material Physics**

Modality: **online**

Duration: **12 months.**

Accreditation: **60 ECTS**


tech global university

Mr./Ms. ____________, with identification document ____________
has successfully passed and obtained the title of:

Master's Degree in Material Physics

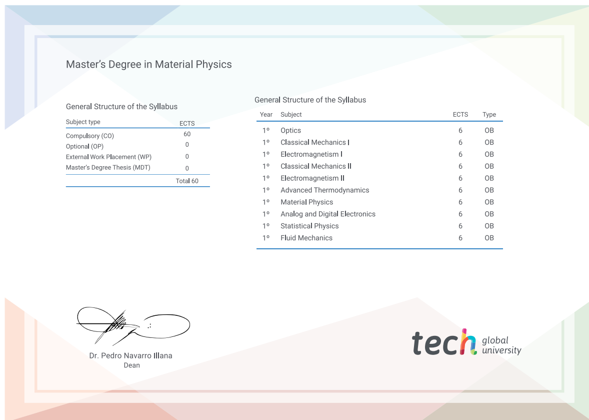
This is a private qualification of 1,800 hours of duration equivalent to 60 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates


Master's Degree in Material Physics

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 60

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Optics	6	OB
1º	Classical Mechanics I	6	OB
1º	Electromagnetism I	6	OB
1º	Classical Mechanics II	6	OB
1º	Electromagnetism II	6	OB
1º	Advanced Thermodynamics	6	OB
1º	Material Physics	6	OB
1º	Analog and Digital Electronics	6	OB
1º	Statistical Physics	6	OB
1º	Fluid Mechanics	6	OB

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Dean

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*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

Master's Degree
Material Physics

- Modality: **online**
- Duration: **12 months.**
- Certificate: **TECH Global University**
- Accreditation: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Master's Degree
Material Physics

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