UNIVERSITÀ DI PARMA

MATERIALS SCIENCE AND TECHNOLOGY	
CYCLE	**XLI**
COORDINATOR	Prof. Mauro RICCO' email: mauro.ricco@unipr.it Department of Mathematical, Physical and Computer Sciences
DURATION	3 years
STARTING DATE OF THE PHD PROGRAM	01/11/2025
PARTNER INSTITUTION	• The Italian National Research Council (C.N.R.)
POSITIONS PUT OUT TO COMPETITION	**12**
ADMISSION PROCEDURES	Assessment of QUALIFICATIONS Oral Exam in PRESENCE or REMOTELY
ADMISSION REQUIREMENTS	Regardless of age and citizenship, applicants holding at least one of the following academic qualifications can apply for admission: – Laurea specialistica or Laurea magistrale (second cycle master's degree) – Laurea Vecchio Ordinamento (degree obtained under the previous Italian regulations); – Second cycle Master's degree obtained abroad, equivalent to the above mentioned Italian degrees and recognized as suitable for the admission to doctoral program Undergraduates can also apply for admission to the selection, with the obligation to obtain the degree **by 31.10.2025**

TRAINING OBJECTIVES

The Ph.D. in "Materials Science and Technology" aims to provide graduates in: Materials Science, Physics, Chemistry, Industrial Chemistry, Biological Sciences, Biotechnology and Engineering with the necessary skills to carry out research activities of high scientific and professional qualification in the field of Materials Science and Technology at Universities, Research Centers or private entities. The course offers a strong, interdisciplinary preparation with specific courses, as well as with research activities conducted also abroad within scientific collaborations.

RESEARCH AREAS

- Materials for sensors and bioelectronics
- Materials for electrochemical storage (batteries and supercapacitors)
- Nanodiagnostic techniques
- Auxetic polymers
- Supramolecular sensors and devices
- Carbon nanostructures
- Low-dimensional semiconductor structures
- Self-repairing and self-diagnostic polymers
- Ceramic and composite materials
- Vitrimers
- Materials for bionanotechnology and nanomedicine
- Photocatalytic solid foams
- Semiconductor materials for applications in power electronics and UVC radiation detection
- Porous materials for chemical separation
- Molecular and nanostructured materials for energy, health and environment
- Multifunctional magnetic thin films and nanostructures
- Magnetic materials for energy transition (permanent magnets, shape memory magnetic materials, magnetocaloric materials)
- Composite hydrogels for 3D printing of biomatrices for tissue engineering (BIO X 3D printer - CNR-ISSMC ; Bio-Hybrid Composites for Regenerative Medicine - CNR-ISSMC)

UNIVERSITÀ DI PARMA

Position with Scholarship		
N°	***Funding entity***	***Research Topic***
1	Scholarship funded by The Italian National Research Council C.N.R. - ISSMC	Multifunctional geopolymer materials for the process, environmental recovery, construction and transport industries
1	Scholarship funded by The Italian National Research Council C.N.R. - IMEM	Study of the chemical, mechanical and electronic properties of metal-organic compounds on conducting and insulating substrates by XPS spectroscopy and scanning probe microscopy
Position with Scholarship LINKED TO SPECIFIC TOPICS (art. 6 of the Competition notice)		
N°	***Funding entity***	***BOUND RESEARCH TOPIC***
1	Scholarship partly financed with UNIVERSITY funds and co-financed by the Department of Chemistry, Life Sciences and Environmental Sustainability (funds AIRC MFAG 2024 "CRISPR-Cas-Powered Detection Technologies for Protein Biomarkers in Bodily Fluids CUP D53C24005900007)	Development of molecular diagnostic strategies based on CRISPR-Cas systems and programmable DNA nanotechnologies for the ultra-sensitive quantification of cancer protein markers
1	Scholarship partly financed with MINISTERIAL funds and UNIVERSITY funds and co-financed by The Italian National Research Council C.N.R. - ISSMC	Injectable composite hydrogels obtained from biopolymers derived from renewable raw materials and nanostructured and multifunctional particles of highly biomimetic and resorbable hydroxyapatites. They will be formulated to be processed using 3D printing techniques in order to obtain three-dimensional structures that reproduce the microenvironment of the extracellular matrix and customized for the engineering of in vitro organoids for personalized medicine
1	Scholarship partly financed with UNIVERSITY funds and co-financed by the Department of Chemistry, Life Sciences and Environmental Sustainability	Bioactive and Fluorescent Nanomaterials for Advanced Applications in Nanomedicine
1	Scholarship partly financed with MINISTERIAL funds and co-financed by The Italian National Research Council C.N.R. - IMEM	Novel Magnetic Materials with Reduced Critical Raw Material Content for Permanent Magnet Applications
1	Scholarship partly financed with MINISTERIAL funds and co-financed by The Italian National Research Council C.N.R. - IMEM	Structural and optical characterization with electron microscopy techniques (TEM, SEM-CL/PL) of multifunctional materials and devices
1	Scholarship partly financed with MINISTERIAL funds and co-financed by The Italian National Research Council C.N.R. - IMEM	Mechanochemical synthesis of new inorganic semiconductor materials with multifunctional properties and film deposition from liquid phase or vacuum techniques for the realization of photoelectric devices
1	Scholarship partly financed with MINISTERIAL funds and co-financed by The Italian National Research Council C.N.R. - ISSMC	Replacement of critical raw materials (CRM) with non-critical raw materials in ceramic materials: eco-design of products and components for the ceramic industry. Definition of the main properties defined along the ceramic process with the aim of identifying and consequently minimizing any critical issues along the production chain

1	Scholarship partly financed with MINISTERIAL funds and co-financed by the Department of Chemistry, Life Sciences and Environmental Sustainability	Development of analytical methods coupled with the use of machine learning techniques for untargeted analysis and characterization of materials at the micro and nanoscale level
1	Scholarship partly financed with MINISTERIAL funds and co-financed by the Department of Mathematical, Physical and Computer Sciences (funds Project CASTLE - ERC-2022-SYG PROGRAM HORIZON EUROPE, G.A. n. 101071533, CUP D93C22001170006")	Theoretical and computational modeling of functional molecular materials with special reference to the phenomenon of Chirality Induced Spin Selectivity (CISS).
1	Scholarship funded by EMILIA ROMAGNA REGION (PR.FSE + 2021/2027 – DGR n. 344 del 10/03/2025) - CUP D92J25000110002	Molecular and Polymeric Materials for Carbon Dioxide Capture, Use and Storage: MaMo-CCUS

ADMISSION PROCEDURES

Assessment of QUALIFICATIONS: up to 60 points
(a minimum score of 30 points shall be required to be admitted to the Oral Exam)
ORAL EXAM: up to 60 points
Minimum score for ELIGIBILITY: 70/120

ORAL EXAM PROGRAM

THE ORAL EXAM TAKES IN THE PRESENCE and with the possibility of carrying out the interview **REMOTELY** for candidates residing abroad or temporarily abroad for study / work reasons. To this end, candidates **must submit a motivated REQUEST as per the model attached to the competition announcement)**

The ORAL EXAM will focus on the candidate's motivation to attend the PhD, on the description of his specific research interests and on a discussion of the qualifications presented by the candidate.

Foreign Language the fluency of which shall be assessed during the Oral Exam	**ENGLISH**	The evaluation of the knowledge of this language will be oral and will consist in translating of a scientific text.

SCHEDULE OF THE ADMISSION EXAMS

ASSESSMENT OF QUALIFICATIONS		It is the candidate's responsibility to verify the outcome of the evaluation of qualifications, which can be consulted in their reserved area by connecting to the page http://unipr.esse3.cineca.it/Home.do in the days preceding the date of the Oral Exam
ORAL EXAM	**DATE**	4th September 2025 (with possible extension in the following days)
	TIME	09:30 am (Italian Time)
	PLACE	ROOM 1 BIOSCIENCES BUILDING Department of Chemistry, Life Sciences and Environmental Sustainability Parco Area delle Scienze, 11/A – Campus 43124 PARMA - ITALY

UNIVERSITÀ DI PARMA

FURTHER INFORMATION	**The choice of the Research Topic to be expressed in Annex A is not binding on the assignment of the research project, and it is intended to assess candidates' skills during the admission exam.** The PhD research topic will be assigned by the Academic Board.	
	THE INTERVIEW MAY BE HELD ALSO IN ENGLISH	For foreign candidates, the admission examinations may be held in English at the candidate's choice.

LIST OF QUALIFICATIONS TO BE SUBMITTED AND THEIR ASSESSMENT		
MANDATORY DOCUMENTS TO BE ATTACHED TO THE ON-LINE APPLICATION		
ANNEX A	(art. 3.2 of the Competition notice)	
Identification Document	Scanned Copy of a valid identity document with photo (i.e. identity card, passport)	
Curriculum Vitae et studiorum	No specific CV format is required (see art. 3.2 of the Competition notice)	
Abstract of degree thesis	Abstract of the second cycle master's degree thesis. Undergraduate applicants must submit the draft of the thesis approved by their supervisor (abstract/draft of the thesis: 10.000 characters including spaces)	
Academic Qualifications	**Certificates and academic transcript of records for both Bachelor' and Master' degrees** containing the following details for each degree held: (art. 3.2 of the Competition notice): University that granted the degree - Type of degree (first cycle/second cycle/single cycle) Name of the degree program - Date of graduation - Final mark - List of exams and corresponding scores (academic transcript of records) - Translation into Italian or English (only for degrees issued in languages other than Italian or English).	
LIST OF EVALUABLE QUALIFICATIONS (only qualifications attested by a document drawn up in Italian or in English)		
Curriculum Vitae et studiorum	Including academic career and postgraduate experience, accompanied by a statutory declaration in lieu of the certification of the exams passed with the relevant marks, as well as the final graduation mark.	**Up to 20 points**
Graduation mark	Score related to the final mark: - 110 with honors (magna cum laude): 20 points - 110: 16 points - From 105 to 109: 12 points - From 100 to 104: 8 points - From 95 to 99: 4 points - Under 95: 0 points	**Up to 20 points**
Average of the exam marks (if the candidate will attain the degree no later than 31 October 2025)	Score related to the average of the exam marks: - 30/30: 20 points - From 28/30 to 29/30: 16 points - From 26/30 to 27/30: 12 points - 25/30: 8 points - 24/30: 4 points - Under 24/30: 0 points	**Up to 20 points**
Graduation thesis	Consistency of the Master's Degree thesis with the doctoral program research topics (briefly describe the topics in the curriculum vitae)	**Up to 10 points**

Statement of Research Interest	Short text – maximum 2 pages – in Italian or in English, aimed at explaining the candidate's reasons to attend the PhD program and at describing her/his specific research interests	**Up to 5 points**
Scientific Publications	Articles and/or reviews in scientific journals with peer reviewing, abstracts of papers or posters presented at conventions or meetings	**Up to 5 points**

EVALUATION ORAL EXAM		
Interview Program	**Evaluation CRITERIA**	**POINTS**
The ORAL exam includes the presentation and discussion of the master's thesis and the statement of research interest; it is intended to assess the suitability of the applicant to pursue scientific research as well as the general knowledge of issues connected to the PhD course	○ knowledge of foreign languages: 10 points ○ general knowledge of issue connected to the Master's thesis: 25 points ○ general knowledge of issues connected to the PhD course: 25 points	**Up to 60 points**