

**TENURE-TRACK FACULTY POSITION IN PHYSICS
INSTITUTE OF PHYSICS, UNIVERSITY OF SÃO PAULO, BRAZIL**

Announcement IF-81, 2024

Announcement of an open tenure-track faculty position at the Institute of Physics, University of São Paulo, Brazil, Level MS-3, RDIDP (Full-time dedication to teaching and research) at the Department of Materials Physics and Mechanics.

The Director of the Institute of Physics at the University of São Paulo, Professor Kaline Rabelo Coutinho, invites applications for a full-time tenure-track faculty position in the field of “**Experimental or Theoretical Research in Condensed Matter Physics**” to be appointed in 2025. Eligible candidates should have a Ph.D. and postdoctoral research experience. Applicants should possess an outstanding potential to establish an independent research program and a commitment to teach undergraduate and graduate courses in Portuguese, 2 years after appointment. This position comprises full-time dedication to research and teaching, level MS-3, RDIDP. Salary is **R\$15.498,97**, non-negotiable. The position nº **1231944** at the Department of Materials Physics and Mechanics is open for applicants for 90 days, from **December 18th, 2024, at 12:01 a.m. to March 17th, 2025, at 11:59 p.m. (GMT -3, Brasília time)**. The following is the detailed description of the program for the examinations:

Introduction to Solid State Physics (4300402) Crystalline structure. X-ray diffraction and reciprocal lattice. Crystalline bonds. Lattice vibrations, phonons, and thermal properties. Fermi gas of free electrons. Energy bands. Semiconductors. Metals and Fermi surfaces. Optical processes. Magnetism. Superconductivity.

Quantum Physics (4302311) 1. Evidence for an atomic description of matter. 2. Experimental evidence for the quantization of electromagnetic radiation: the black body problem, specific heat of solids, photoelectric effect, Compton effect, production and annihilation of the electron-positron pair. 3. The Rutherford model and the problem of atomic stability, the Bohr model. 4. The wave-particle duality in the case of electromagnetic radiation. X-ray and electron diffraction. The Broglie hypothesis and wave-particle duality. 5. Postulates of Wave Quantum Mechanics. 6. Wave packets, group velocity, and uncertainty relations. 7. The one-dimensional time-dependent Schrödinger equation. Discussion of some stationary solutions of the Schrödinger equation with one-dimensional constant potentials. 8. The Schrödinger equation in three dimensions. Particle in the cubic box. Degeneration. 9. The Schrödinger equation for central potentials and the radial solution of the hydrogen atom in quantum mechanics.

Applications

1. Applications must be submitted exclusively via the link <https://uspdigital.usp.br/gr/admissao> during the period stated above, informing his/her personal data and the Department for which he/she is applying, accompanied by the following documents:

- I - Detailed Curriculum Vitae (.pdf), outlining his/her experience in the specific area of the opening, list of published papers, activities related to the field of application, a two years research project and any complementary information which enables assessing the merits of the applicant;
 - II - Proof of a PhD degree with national validity, or accredited by the Institute of Physics of the University of São Paulo;
 - III – For Brazilian male applicants, proof of discharge from military service;
 - IV - For Brazilian applicants, electoral discharge certificate or detailed certificate issued by the Electoral court less than 30 days before the start of the application period.
 - 1.1. An applicant already appointed at USP is exempted from the requirements III and IV, if these requirements were met during his/her appointment.
 - 1.2. Foreign applicants are exempted from the requirements III and IV, instead, he/she must submit a copy of the identity pages in the passport.
 - 1.3. An appointed foreign applicant may only take office if holding a temporary or permanent visa, which grants to the holder permission to exercise remunerated activities in Brazil.
 - 1.4. Upon registration, foreign applicants may submit a written request to take the application exams in English. The contents of the examinations conducted in English or in Portuguese will be identical.
 - 1.5. Upon registration, applicants with disabilities or special needs must submit a request for the necessary conditions being provided during the examinations.
2. The General Committee of the Institute of Physics will judge and announce the formal acceptance of the applications.
 - 2.1. The examination of the candidates will take place within 30 and 120 days, after the formal acceptance of the applications.
 3. The examination of the candidates will consist of the following exams.
 - I) Analysis and public examination of the Curriculum Vitae – weight 4 .
 - II) Teaching exam (public lecture on a subject within the topics described above) – weight 3.
 - III) Public examination of the research project - weight 3.
 - 3.1. The list of eligible applicants will be published in the São Paulo State Official Gazette.
 - 3.2. Candidates who arrive late to the exams will be ineligible to proceed.

PUBLIC EXAMINATION OF THE CURRICULUM VITAE

4. The evaluation of the Curriculum Vitae includes a public examination graded by each member of the Committee.

Sole paragraph - The grading of the Curriculum Vitae must consider: I – the scientific, literary, philosophical, or artistic production; II - university teaching activities; III - services to the community; IV - professional or other activities, if applicable; V - degrees and university honors.

TEACHING EXAM

5. The public Teaching Exam consists of a 40 to 60-min lecture on a topic drawn from a list of topics. The lecture will begin 24 hours after the drawing.

I – The Examining Committee will prepare and announce a list of ten topics within the program detailed above;

II – Immediately after becoming aware of the examination topics, candidates may ask to replace one or more topics they understand not belonging to the program. The Examining Committee will decide the claim and if necessary, substitute the topics under objection.

III – After drawing the topic, a 24-h period to prepare the lecture will start. The lecture will begin the next day, at the same time of the drawing. The candidate may not waive this deadline.

IV - Candidates may use and consult all materials he/she deems necessary.

PUBLIC EXAMINATION OF THE RESEARCH PROJECT

6. The examination of the Research Project will be in the form of a dialogue: A short oral presentation of the project to the Committee (if asked for), up to sixty minutes questioning by the Committee and the same time, sixty minutes, for the answers of the candidate.

I - The Research Project, should consider its actual feasibility at the existing infrastructure of the Institute and must be framed within the field of the announcement.

GRADING

7. After the exams, members of the Examination Committee will individually grade each candidate.
8. The grades may range from zero to ten, with one decimal place.
9. Each candidate will have a final grade given by each member of the Examination Committee. The final grade is calculated as a weighted average (according to the weights given in item 3) of the grades of each exam.

§ 1º - Differentiated score formula to be applied for candidates of Black, Mixed-race, and Indigenous ethnicities (PPI candidates):

$$PD = (MCA - MCPPI) / MCPPI$$

Where:

- PD is the differentiated score to be added to the grades of all candidates who expressed interest in participating in the differentiated score.
- MCA is the average score of the broad competition among all candidates, excluding those who did not reach the minimum score referred to in item 10 of this Edict and PPI candidates participating in the differentiated score.
- MCPPI is the average score among all PPI candidates, excluding those who did not reach the minimum score referred to in item 10 of this Edict.

§ 2º - The formula to account for the differentiated score in the final grades of PPI candidates is:

$$NFCPPI = (1 + PD) * NSCPPI$$

Where:

- NFCPPI is the final grade of the public examination, after applying the differentiated score. It will generate the candidate's classification in the public examination stage, limited to the maximum grade stipulated in the Edict. At the end of the public examination, the final grade will be considered the candidate's simple grade.
 - NSCPPI is the simple score of the PPI candidate, on which the differentiated score will be applied.
 - § 3º - The calculations referred to in §1 and §2 of this item must consider two decimal places and fractions greater than or equal to 0.5 (five-tenths) must be rounded to the next whole number.
 - § 4º - The differentiated score (PD) provided for in this article applies to all qualified candidates, that is, those who have achieved the minimum performance established in the Edict, considering for this last purpose the simple score.
 - § 5º - If there are no PPI candidates with differentiated score among those qualified, the differentiated score will not be calculated.
 - § 6º - The differentiated score will not be applied when, in the differentiated score (PD) calculation formula, the MCPPI (average PPI competition score) is greater than the MCA (average broad competition score).
10. To be eligible, candidates must achieve a minimum final grade of seven from the majority of examiners.
 11. Each examiner will nominate the candidate he/she graded highest.
 12. The candidate receiving most nominations by the Examination Committee will be indicated for appointment.
 13. The Examination Committee will publicly announce the results of the examination immediately after its completion.
 14. The effective appointment to the position depends on a medical examination conducted by the State's Department of Medical Skills (DPME), pursuant to article 47, VI, of Law No.10.261/68.
 15. Further information and relevant rules for the examination are available at the Academic Assistance Department of the Institute of Physics, University of São Paulo, and e-mail ataac@if.usp.br.

Legal provisions: Announcement IF-81, 2024, approved during the 613th Ordinary Session of the Institute of Physics Committee, held on 11/28/2024. Decree GR 8602, 2024, Deliberation GR/Circ/109, art. 125, paragraph 1, of USP's General Regulations and by the Rules of the Institute of Physics: Resolutions No. 4,087 of June 21, 1994, 4,265 of May 3, 1996, 5,367 of October 18, 2006 and 5,829 of April 4, 2010. Authorization for taking exams in English: paragraph 8 of art.135 of the General Rules. The joining to the faculty in the Full-Time Regime (RDIDP) is conditional upon the approval of the Special Work Regime Committee (CERT), in accordance with Resolution 7271/16 and other applicable rules, and implies in exclusive relationship with USP, under ARTICLE 197 of the General Rules.

São Paulo, December 6th, 2024.

ANNEX – JUSTIFICATION FOR THE GRANTING OF THE FACULTY POSITION

Current Situation of the Department/Area

The primary mission of the Department of Materials Physics and Mechanics, as outlined in its Academic Project, is to conduct impactful research in both fundamental and applied science, fostering a community of young leaders in condensed matter physics. This impact arises from the combination of fundamental physics and its applications, integrating theory with experimentation and merging research with innovative teaching to cultivate a stimulating intellectual environment. The DFMT comprises two major research groups: one focusing on theoretical research in Condensed Matter Physics and Materials, and the other on experimental research. An analysis of the DFMT's performance indicators from the previous period (2019-2023) shows that the department has effectively fulfilled its role. Faculty performance is commendable across all expected activities, including teaching, research, outreach, management and mentoring. Out of the twenty-three faculty members, seventeen are productivity grant holders from CNPq (~ 74%). Our faculty spearheads significant projects, including FAPESP Thematic Projects and funding from the productive sector, along with various other FAPESP grants and international collaborations. Consequently, this positions our department prominently within the national scene.

Furthermore, an analysis of DFMT has also identified that all current faculty members in the department are in an intermediate or advanced stage of their careers, over 40 years old. Actually, it is understood the importance of hiring young talent in order to create a more diverse environment.

General Goal

The hiring of the new member aims to strengthen the faculties of DFMT and IFUSP. The new member will engage in research, teaching and extension activities and would also be encouraged to participate in innovation efforts, continually striving for excellence in all areas. This position also seeks to attract younger members to the department, enhancing academic perspectives and reinforcing diversity. Concerning the chosen specific area of Experimental or Theoretical Research in Condensed Matter Physics, this broad scope encompasses all research areas within the department. Our goal is to select the brightest candidate, regardless of their specific area of expertise. This new position is crucial for maintaining the department's competitiveness.

INDIVIDUALIZED PLAN

a) Teaching - Goals

The newly hired faculty member will work in the Department and in the Institute on both undergraduate and graduate teaching activities. This faculty member is expected to teach courses in basic physics, including in-service courses, as well as advanced courses in Condensed Matter Physics at the graduate level. They will actively mentor undergraduate and graduate students and supervise postdoctoral researchers. Teaching activities are expected to start upon hiring, with other mentoring activities commencing within the first year of the contract.

b) Research and Innovation - Goals

The goal of DFMT, as outlined in its academic project, is to increase all indexes (per faculty member) related to research, including the numbers of published articles, articles in prominent journals, research productivity grant holders and research projects funded by financing agencies and companies. Other goals add: the expansion of national and international scientific collaborations; the growth of participation in both national and international congresses and conferences; the increase in fundraising aimed at modernizing the instrumental park; the increase in computational and laboratory facilities; the continuation of playing a prominent role in the national community of condensed matter and materials physics; carrying on collaboration with the Brazilian and global scientific community not only in participating in committees, panels, editorial boards of journals, etc but also through issuing opinions to newspapers, funding agencies, etc.

Another initiative to be pursued by the Department is to encourage our faculty to undertake research internships abroad systematically, analogous to the so-called sabbatical year. Concerning the new young member, it is expected, but not mandatory, that he/she has already an international experience. Excellent candidates who stand out but do not have international experience are also welcome.

In this context, it is expected that the new faculty member at DFMT will maintain a robust independent research program. This includes the submission of requests to funding agencies within the first year of hiring; the request for a productivity grant in the first year of hiring; the supervision of undergraduate and graduate students (with submission of grant requests to funding agencies) in the first year of hiring; the publication of outstanding articles in journals in the area of condensed matter physics.

Depending on the candidate's profile, as well as their research line, there is an expectation that the future hired faculty member will engage in activities and actions related to innovation.

Indicators in this regard include the quality and quantity of published articles as well as the number of funding obtained.

c) Culture and Extension - Goals

Regarding Culture and Extension, we have identified that there are many opportunities for faculty members to engage within the department, all related to research developed at DFMT. This includes, among other topics, cryogenic research, superconductivity phenomena, virtual reality and artificial intelligence. These topics are of broad interest to the general public, creating a window of opportunity for interaction between educators and society through knowledge dissemination actions. There are several faculty members in the Department who carry out robust and prominent activities at the IF, qualifying them as some of the main actors in this area of IF. There is an expectation that the new faculty member will engage in these activities, bringing vision and new ideas to existing actions within IFUSP, such as the "Physics Show" and the "Physics for All" series, as well as new actions proposed by him/her.

EXPECTED IMPACT WITH THE HIRING

The hiring of a new PhD member in the area of Experimental or Theoretical Research in Condensed Matter Physics, considering the ongoing objective of improving undergraduate courses and their subjects, will contribute to the set of goals proposed in the Department and Institute's Academic Project. He/she will collaborate with the Graduate Program, both in proposing and offering courses and in supervising

dissertations and theses. He/she will contribute to the smooth progress of the Culture and Extension activities of the Department and the IF. With the hiring of the new member, the Department expects to improve all its research-related metrics. There is also the possibility of contributing to the increase in diversity in the department through the hiring of young faculty.

a) Short, medium, and long terms:

Considering the temporal scope, we could anticipate the following impacts:

In the short term: an immediate replacement of the teaching staff at DFMT and IF as well as the inclusion of young researchers within the department, bringing new ideas and an entrepreneurial spirit.

In the medium and long term: expand the research-related indexes, including the number of published articles, the numbers of articles in prominent journals, research productivity grant holders and research projects funded by financing agencies and companies; expand national and international scientific collaborations; increase participation in national and international congresses and conferences; increase fundraising efforts to modernize the instrumental park; expand computational and laboratory facilities; continue to play a prominent role in the national condensed matter and materials physics community.