

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

Announcement IF-69,2024

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 Nuclear Physics Department. at the Institute of Physics, University of São Paulo.

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 “**Nuclear Physics and Applications, with an emphasis on Hadron Theory**” 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 **1245414** at the Nuclear Physics Department is open for applicants for 90 days, from **October 23th, 2024, at 12:01 a.m. to January 20th, 2025, at 11:59 p.m. (GMT -3, Brasília time)**. The following is the detailed description of the program for the examinations:

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. Rutherford's model and the problem of stability of atoms, Bohr's model. 4. Wave-particle duality in the case of electromagnetic radiation. X-ray and electron diffraction. The de Broglie hypothesis and particle-wave duality. 5. Postulates of Quantum Wave Mechanics. 6. Wave packets, group velocity and uncertainty relations. 7. The time-dependent one-dimensional Schroedinger equation. Discussion of some stationary solutions of the Schroedinger equation with one-dimensional constant potentials. 8. Schroedinger's equation in three dimensions. Particle in cubic box. Degeneration. 9. Schroedinger's equation for central potentials and the radial solution of the hydrogen atom in quantum mechanics.

Introduction to Elementary Particle Physics (**4300422**) Review of Relativistic Mechanics. System of units $\hbar = c = 1$. Bases of particle physics. Experimental high energy physics. Symmetries in quantum mechanics and conservation laws. Additive conservation laws. Parity, isospin and other symmetries. Brief introduction to gauge theories: global and local symmetries.

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:
$$\text{NFCPPI} = (1 + \text{PD}) * \text{NSCPPI}$$
- 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-68, 2024, approved during the 611th Ordinary Session of the Institute of Physics Committee, held on 09/26/2024. Decree GR 8318, 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, October 7th, 2024.

Current Situation of the Department/Area

The Department of Nuclear Physics (DFN) has a long tradition of research in theoretical nuclear physics. Most of the IF's theoretical nuclear physicists passed through the DFN. These theorists have always been working in tune with experimental nuclear physics groups.

In the world, over the last few decades, experimental nuclear physics has evolved towards the study of high-energy collisions and has moved closer to the physics of elementary particles with strong interactions:

hadron physics. At DFN, the high energy experimental nuclear physics group was created, which has gained an excellent international reputation. To continue increasing the impact of your work, it would be important to increase the connection with the DFN theoretical group.

The DFN group of theoretical physicists also evolved in this direction. In the last twenty years there have been discoveries of new particles, so-called exotic hadrons. Thanks to its group of theorists, the DFN played a prominent role in the study of these new states, occupying a reference position in the area, with great international visibility. The world's large laboratories have been increasing investment in the area of experimental hadron physics, in which there is great potential for important discoveries. Therefore, to maintain national leadership in this area and maintain international competitiveness, it is necessary to expand our pool of researchers

General Goal

The hiring of a new professor aims mainly to strengthen research in theoretical hadron physics and promote greater integration between the group of theorists and the experimental high energy physics group. This new professor could collaborate more closely with the three currently active professors in the area of theoretical hadron physics, enhancing existing lines of investigation and opening up new research opportunities at DFN.

In addition to focusing on research, the new hire will have a fundamental role in teaching, teaching essential subjects in the areas of nuclear physics and elementary particle physics, as well as any other subject in the Physics course.

INDIVIDUALIZED PLAN

a) Teaching - Goals

- Ensure the offering of any mandatory subject offered by IFUSP in its undergraduate and postgraduate courses

b) Research and Innovation - Goals

- Strengthen and expand research in theoretical hadron physics, emphasizing integration with experimental groups at DFN and the Institute of Physics in general
- Develop new lines of investigation in theoretical hadron physics, seeking funding for these initiatives both through official supporting foundations and private sources.
- Guide postgraduate students in research projects in theoretical hadron physics, contributing to the training of new researchers in the area.
- Establish and foster scientific collaborations with other groups, both inside and outside IFUSP, expanding the impact and reach of the research carried out.

c) Culture and Extension - Goals

- Contribute to activities already existing at IFUSP, such as the Demonstrations Laboratory and IFUSP's participation in the USP and Profissões fair, among others, or engage in own initiatives, such as lectures or bibliographic production in scientific dissemination

EXPECTED IMPACT WITH THE HIRING

The person hired must ensure the regular offering of essential subjects in the area of hadron physics as well as any other subject offered by IFUSP in its undergraduate and postgraduate courses. At the same time, the new professor is expected to begin implementing new lines of research in theoretical hadron physics and strengthen the connection with existing experimental groups at IFUSP.

In the medium term, it is expected that the new professor will propose postgraduate courses aligned with the new lines of research developed, enriching the institute's academic curriculum. In addition, the person hired will be expected to guide master's students, contributing significantly to the postgraduate program. Another expected impact is the expansion of scientific collaborations, both within IFUSP and with external groups, including international partnerships.

In the long term, the person hired must play a crucial role in training high-level human resources, mentoring doctoral students and supervising postdoctoral students. In terms of Culture and Extension, the teacher is expected to actively participate in activities already established at IFUSP, such as the Demonstration Laboratory and the USP and Professions fair, in addition to engaging in their own initiatives, such as lectures, bibliographic production in publicity, scientific, and other extension activities.