

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

**Announcement IF-80,2024**

**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 Mathematical 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 “**Elementary Particle 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 **1230212** at the Mathematical Physics Department is open for applicants for 90 days, from **January 8th, 2024, at 12:01 a.m. to April 7th, 2024, at 11:59 p.m. (GMT 3, Brasília time)**. The following is the detailed description of the program for the examinations:

**Quantum Mechanics I (4302403)** - 1. General Structure of Quantum Mechanics. 2. Operator methods and two level systems. 3. The Schrödinger equation in three dimensions. 4. Central potentials. Angular momentum. Hydrogen atom. 5. Spin. Identical particles. Pauli exclusion principle. 6. Time-independent perturbation theory and applications.

**Quantum Mechanics II (4302404)** - 1. Addition of angular momentum. 2. Two-particle systems with spin. Clebsch-Gordan coefficients. 3. Heisenberg representation. Time evolution in terms of operators. 4. Approximation methods: time-independent perturbation theory; variational method. 5. Fine-structure of the hydrogen atom. 6. Time-dependent perturbation theory. Einstein coefficients. 7. Atom in the presence of a radiation field. Fermi's golden rule. 8. Scattering theory. Born approximation. Partial waves.

**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. Each examiner will nominate the candidate he/she graded highest.
  11. The candidate receiving most nominations by the Examination Committee will be indicated for appointment.
  12. The Examination Committee will publicly announce the results of the examination immediately after its completion.
  13. 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.
  14. 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](mailto:ataac@if.usp.br).

Legal provisions: Announcement IF-80, 2024, approved during the 613<sup>th</sup> Ordinary Session of the Institute of Physics Committee, held on 11/28/2024. Information 8584/24, 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 2<sup>nd</sup>, 2024.

## ANNEX – JUSTIFICATION FOR THE GRANTING OF THE FACULTY POSITION

## **Current Situation of the Department/Area (Contextualization):**

The DFMA academic project specifies our mission as promoting the generation and dissemination of knowledge, as well as the training of human resources in the areas of greatest impact on the frontier of fundamental physics. We have obtained financial support from several agencies and hosted several projects. Most of our faculty members have PQ Grants and are principal investigators in several projects. We work in the areas of Cosmology, Elementary Particle Physics, Quantum Field and String Theory, Mathematical Physics, Heavy Ion Physics, and Quantum Information. We have played an active role in teaching, both at the undergraduate and graduate levels.

Particle Physics is an area that in many ways connects microscopic and macroscopic scales. Experiments involving quantum sensors that are being proposed for the investigation of fundamental physics will certainly open a new window on the microscopic world in the coming years. The new frontiers that observations of cosmology, black holes, gravitational waves and extragalactic neutrinos have already opened require changes in the theoretical paradigms of the Particle Physics field. Therefore, hiring a professor in this area is intended not only to maintain the academic excellence of the DFMA, but also to ensure the continuity of research, teaching and the training of new researchers in this field.

### - General Objective of the Faculty Hiring:

The hiring aims to strengthen the DFMA faculty, ensuring the continuity of teaching, research and extension in this crucial field of study. In addition, it seeks to promote academic excellence, foster scientific production and provide quality education to students, preparing them for the challenges and advances in the field of elementary particles. The new hiring therefore aims to keep the DFMA up to date and competitive, contributing to the advancement of scientific knowledge.

### - INDIVIDUALIZED PLAN

#### a) Teaching - Goals (describe activities, indicators, and timelines):

A new professor will make an important contribution to the undergraduate teaching load, which has been severely affected by several faculty losses in recent years. He or she will also be expected to teach postgraduate courses, improving the education of our students. We would also like to add the importance of scientific research supervision, an activity that is highly encouraged at DFMA and which, together with postgraduate supervision, forms the foundation for the training of new scientific staff.

#### b) Research and Innovation - Goals (describe activities, indicators, and timelines):

The established goals involve a set of strategic activities to promote the advancement of knowledge in Particle Physics. These include holding lectures and practical classes, supervising postgraduate students and the ongoing development of pioneering studies. The indicators will be considered: the number and quality of publications in renowned journals, obtaining funding for projects and participating in relevant academic events. These goals will be monitored regularly, aiming to ensure excellence in scientific production and the continuity of DFMA as a reference in the field.

#### c) Culture and Outreach - Goals (describe activities, indicators, and timelines):

We have developed scientific outreach programs, such as the "Invitation to Physics", a series of colloquia aimed at promoting various areas of research among undergraduate students and the general public, in addition to the participation of our professors in mini-courses and conferences. The other professors in the particle science area also have a strong presence in outreach activities both inside and outside USP, responding to society's great curiosity about the area. The new professor may participate in these

projects and initiatives, including organizing and curating these events, or even proposing other outreach activities.

**- EXPECTED IMPACT OF THE HIRING:**

The hiring should boost DFMA, increasing its academic excellence and expanding research and teaching opportunities. An increase in scientific production is expected, with more publications and greater fundraising for projects. In addition, the presence of the new professor should benefit student training and promote outreach activities. In short, the hiring not only fills the gap left by the departing professor, but also strengthens the department and contributes to the advancement of science and education in Elementary Particle Physics.

a) Short, Medium, and Long-Term:

The requested hiring will immediately allow the replacement of the faculty within an important line of research, allowing the consolidation of a research group similar to that of major international research institutions in Theoretical Physics.