

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

### Announcement IF-77,2024

**Announcement of two open tenure-track faculty positions at the Institute of Physics, University of São Paulo, Brazil, Level MS-3, RDIDP (Full-time dedication to teaching and research) at the Applied 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 two full-time tenure-track faculty positions in the field of “**Physics Education Research**” 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. These two positions comprise full-time dedication to research and teaching, level MS-3, RDIDP. Salary is **R\$15.498,97**, non-negotiable. The position nº **1262416 and 1262424** at the Applied Physics Department is open for applicants for 90 days, from **November 21<sup>th</sup>, 2024, at 12:01 a.m. to February 18<sup>th</sup>, 2025, at 11:59 p.m. (GMT -3, Brasília time)**. The following is the detailed description of the program for the examinations:

**Electricity and Magnetism 1 (4300270)** - Experimental evidence for the existence of charges in neutral matter and their quantization; 2. Insulators and conductors materials - electrification by friction and induction; 3. Coulomb's law - electric field; 4. Gauss's law; 5. Electric potential energy and potential difference - equipotential surfaces; 6. Electric current - microscopic model - resistance. Qualitative discussion of band diagrams for conductors, insulators and semiconductors; 7. Magnetic field - permanent magnets and Earth's magnetic field. Qualitative discussion of the atomic magnetic dipole moment; 8. Magnetic field flow and Gauss's law for the magnetic field; 9. Magnetic field produced by currents - Force between wires with currents; 10. Magnetic force on a moving charge, discussion of charge/mass ratio ( $e/m$ ), experiments by J.J. Thomson (cathode rays). Thomson's experiments (cathode rays) and Millikan's experiment - Mass spectrometer; 11. Relationship between electricity and magnetism - Biot-Savart law - Ampère's law; 12. Electrical induction - Faraday's experiment - Lenz's law - Inductance and mutual inductance; 13. Solenoids - Magnetic energy; 14. Synthesis of Electromagnetism - Maxwell's equations.

**Elements and Strategies for Physics Teaching (4300356)** - 1. Historical and individual construction of physical knowledge. 2. nature of physical and scientific knowledge: the role of physics and science in society, the historical and social contexts of their development. 3) The structure of physical and scientific knowledge: the significance of theories, laws and models; the role of mathematical formalism in physics. 4) The relationship between science, culture and technology. 5. The education as human formation 6. Education from a critical perspective. 7. Education and social transformation 8. The role of science education and the aims of physics in basic education. 9. Curricular guidelines and proposals for teaching physics and science. 10. The construction of scientific knowledge in the learning process. 11. Alternative conceptions, conceptual change and conceptual profile. 12. Proposals for improving the teaching of



physics and science, from the perspective of research and the implications for the school environment: the inclusion of history and philosophy in the development of content, the use of experimental and/or ludic activities in the classroom, the role of the textbook, problem-solving, scientific dissemination, contextualization, everyday life and the use of new technologies in the teaching of physics and science.

## 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](mailto:ataac@if.usp.br).



Legal provisions: Announcement IF-77, 2024, approved during the 612<sup>th</sup> Ordinary Session of the Institute of Physics Committee, held on 10/31/2024. Decree GR 8594, 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, November 11<sup>th</sup>, 2024.

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

## Current Situation of the Department/Area

The Institute of Physics at the University of São Paulo (IFUSP) offers an undergraduate program in Physics Education and hosts the Interunit Graduate Program in Science Teaching (PIEC). The Physics Education Research field comprises six faculty members distributed across three departments (FAP, FNC, and FEP), engaging in various research lines: Didactic Resources for Science Teaching; History, Philosophy, and Culture in Science Education; Science Teaching and Learning; Teacher Training; Science Communication, and Informal Education.

The undergraduate program in Physics Education at IFUSP has a pioneering curriculum structure that integrates theory and practice from the very beginning of the course. It is, therefore, a program with a strong focus on teacher training, supported by a pedagogical teaching laboratory, well-established partnerships with K-12 schools for the development of Practicum, and the involvement of faculty and students in programs, proposals, and policies for teacher education, such as the BNCC, PIBID, PRP, and similar initiatives.

The faculty in this field are heavily involved in providing advisory services to schools, schools systems, and government bodies, as well as in other outreach activities, such as offering continuing education courses for teachers and coordinating projects that support initial teacher training. Thus, we have research, teaching, and outreach activities very well integrated within this field.

### General Goal

The goal is to strengthen the Physics Education Research field at IFUSP by hiring faculty capable of working within the existing research lines and/or expanding them with research projects that engage with contemporary, underexplored topics.

## INDIVIDUALIZED PLAN

### a) Teaching - Goals

Faculty members are expected to contribute to undergraduate teaching responsibilities, particularly in courses related to Physics Education, as outlined in the Educational Project (PPP) of the Physics Teacher Education program. Depending on availability, they are also expected to teach in the Physics and Medical Physics programs, as well as in courses offered by the Institute of Physics to other USP units, with encouragement to propose new courses for both undergraduate and graduate programs.

### b) Research and Innovation - Goals

The hiring of new faculty members for the Physics Education Research area includes the role of supervising students in Scientific Initiation (IC), undergraduate thesis projects, Master's, and PhD programs, promoting their academic development. It is also expected that the faculty member will establish research partnerships with other institutions, aiming to strengthen scientific collaboration and internationalization. Additionally, the faculty member is expected to be proactive in seeking funding for research projects by drafting and submitting proposals to funding agencies.

### c) Culture and Extension - Goals

Faculty members are expected to be involved in the development and delivery of outreach activities, as well as to participate in established outreach projects at IFUSP. This includes contributing to initiatives such as the Ernst Hamburger Demonstration Laboratory, the Art and Science in the Park Project, the International Masterclasses hands-on Particle Physics, and the Physics Show. Additionally, involvement in activities related to partnerships between the university and K-12 schools is expected, including those focused on the continuing education of physics teachers, such as the USP-School Meeting. These goals



aim to promote the integration of teaching, research, and outreach, significantly contributing to the academic, scientific, and cultural advancement of the institution.

## **EXPECTED IMPACT WITH THE HIRING**

In the short term, faculty members are expected to contribute to teaching responsibilities and provide academic supervision for students in Scientific Initiation, Master's, and PhD programs within the Physics Education Research field. Immediate dedication to and development of the research project proposed for the selection process is also expected.

In the medium term, expectations include an increase in academic output related to Physics Education Research at IFUSP, the consolidation or strengthening of new research lines, the possibility of expanding financial support to upgrade facilities and equipment related to Physics Education Research, and the development of human resources through the supervision of Master's, PhD, and postdoctoral students. Additionally, the proposal of new courses for the Physics Teacher Education program and the PIEC.

In the long term, the expected impact involves the development of seniority among faculty members in the research area, their advancement in the career progression plan, and participation in management activities at IFUSP, particularly those related to the Physics Teacher Education program and PIEC. The creation of more comprehensive, interinstitutional, and international research projects is also expected.