

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

**Announcement IF-58,2024**

**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 General 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 **“Statistical 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 **1245430** at the General Physics Department is open for applicants for 90 days, from **August 21<sup>th</sup>, 2024, at 12:01 a.m. to November 18<sup>th</sup>, 2024, at 11:59 p.m. (GMT 3, Brasília time)**. The following is the detailed description of the program for the examinations:

**Physics II (4302112):** Oscillations: harmonic, damped, driven, damped-driven. Resonance. Basic notions of elasticity. Waves in elastic media. Wave reflection. Wave superposition. Interference and diffraction. Beats. Confined waves. Properties of ideal and real gases and relations among macroscopic and microscopic quantities. First Law of Thermodynamics. Important concepts: Heat, Work, Internal Energy, Enthalpy. Second Law of Thermodynamics. Important concepts: Entropy, Gibbs and Helmholtz Free Energy. Applications: engines/refrigerators.

**Statistical Mechanics (4302401):** 1. The laws of thermodynamics 2. Notions of probability; 3. Microcanonical representation. Boltzmann entropy; 4. Canonical representation. Maxwell's velocity distribution law, Partition function and connection with thermodynamics; 5. Einstein's model for the specific heat in solids. Ideal monoatomic gas. Gibbs' paradox. Ideal diatomic gas; 6. Photon gas, thermal radiation. Phonon gas, a linear chain of harmonic oscillators, Debye's theory; 7. Grand-canonical representation. Bose-Einstein and Fermi-Dirac distributions; 8. Free electron gas, electronic thermal capacity; 9. Gases and liquids, configuration integral, second virial coefficient, van der Waals theory

## 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):

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

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. 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-58, 2024, approved during the 609<sup>th</sup> Ordinary Session of the Institute of Physics Committee, held on **06/27/2024**. Decree GR 8318, 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, August 14<sup>th</sup>, 2024.

## ANEXO – JUSTIFICATIVA PARA CONCESSÃO DO CLARO DOCENTE

## Current Situation of the Department/Area

The Department of General Physics at the Institute of Physics (IFUSP) has hosted a prominent Statistical Physics group since its inception. Over the years, this group has trained researchers who have gone on to hold academic positions at universities in Brazil and abroad, as well as being hired by private companies, particularly in the information technology sector. The group is renowned for investigating equilibrium and nonequilibrium statistical models, combining analytical and computational techniques. Areas of study include equilibrium phase transitions, both classical and quantum, in magnetic systems; disorder effects in quantum and classical transitions and in transport phenomena in many-body systems; equilibrium phase transitions in liquid crystals; nonequilibrium phase transitions in agent-based models with multidisciplinary applications; and stochastic thermodynamics of microscopic thermal machines.

## General Objective of Faculty Hiring

The methods of statistical physics have been at the forefront of physics research for several decades. Their primary application area is the investigation of phenomena involving many elements (particles or, more generically, “agents”) that interact with each other, sometimes in the presence of disorder, producing complex and generally chaotic dynamics. These phenomena include those related to biochemical and biophysical processes, epidemics, and numerous phenomena in condensed matter physics.

The group’s membership has significantly decreased in recent years due to retirements. Although the remaining faculty continue to conduct research in multidisciplinary areas such as complex systems modeling, phase transitions in equilibrium and out of equilibrium, and more recently, in classical and quantum stochastic thermodynamics, there are several recent developments in complex systems and stochastic thermodynamics that could be explored by new hires and that have received little to no attention from the current faculty at IFUSP.

Therefore, the general objective of this hiring is to expand the scope of research in statistical physics towards these developments, as well as to address the shortage of professors for courses in Thermodynamics, Statistical Mechanics, Heat Physics, and Thermostatistics, among others.

## INDIVIDUALIZED PLAN

### a) Teaching - Goals

- "Ensure the offering of any mandatory course provided by IFUSP in its undergraduate and graduate programs."

### b) Research and Innovation - Goals

- Implement new research lines related to statistical physics at IFUSP, contributing to keeping the group at the forefront of scientific knowledge.

- Seek research funding for these new lines, either through official support foundations or private sources.

- Supervise graduate students in research projects within these new lines.

- Seek scientific collaborations with other groups within and outside IFUSP.

## **c) Culture and Extension - Goals**

- Contribute to existing activities at IFUSP, such as the Demonstrations Laboratory and IFUSP's participation in the USP and Professions fair, among others, or engage in their own initiatives, such as lectures or the production of scientific outreach literature.

## **EXPECTED IMPACT OF THE HIRING**

In the short term, the hired individual should collaborate to ensure the regular offering of courses in Thermodynamics, Statistical Mechanics, Heat Physics, and Thermostatistics, as well as implement new research lines related to statistical physics at IFUSP, contributing to keeping the group at the forefront of scientific knowledge.

In the medium term, the hired individual should collaborate to ensure the regular offering of the graduate course in Statistical Mechanics and propose graduate courses linked to the new research lines to be explored. Additionally, they should contribute to the graduate program by supervising master's students. Finally, it is expected that the individual has sought collaborations with research groups outside of USP, including international groups, and/or with other research groups at IFUSP.

In the long term, the hired individual should contribute to the training of human resources by supervising doctoral students and postdoctoral researchers. In the area of Culture and Extension, it is expected that the hired individual has contributed to existing activities at IFUSP, such as the Demonstrations Laboratory and IFUSP's participation in the USP and Professions fair, among others, or has engaged in their own initiatives, such as lectures or the production of scientific outreach literature.