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OPENING OF APPLICATIONS FOR THE PUBLIC TENDER AND EXAMINATION OF TITLES AND OTHER EXAMS FOR THE PROVISION OF 01 (ONE) POSITION OF DOCTOR ASSISTANT PROFESSOR, IN THE DEPARTMENT OF MECHANICAL ENGINEERING OF THE POLYTECHNIC COLLEGE OF THE UNIVERSITY OF SÃO PAULO.

Examination in 02 phases

The Dean of the Polytechnic College of the University of São Paulo, Prof. Dr. José Roberto Castilho Piqueira, hereby informs all those interested, as decided by the Congregation in session which was held on the 22th of February of 2018, that applications will be open for a period of 90 (ninety) days, starting at 9AM (Brasilia time) of the 5th March 2018 to 4PM (Brasília time) on the 2nd of June of 2018, to the public tender and examination of titles and other exams to fill 01 (one) position of Doctor Assistant Professor, reference MS-3, in RDIDP, of post # 1234439, with the salary of R \$ 10,670.76 per month (13 gross salaries per year), with the Department of Mechanical Engineering - PME, in the specialty "Numerical Methods and Simulations in Thermofluids", in agreement to articles 44 to 48 of the Internal Regulation of the Polytechnic College, and the respective program that follows:

AREA OF STUDY: “NUMERICAL METHODS AND SIMULATIONS IN THERMOFLUIDS”

1. Fundaments in Thermodynamics

1.1 Introduction and fundamental concepts of thermodynamics. 1.2 Pure substances. 1.3 Work and heat. 1.4 First principle of thermodynamics. 1.5 Second Principle of Thermodynamics. 1.6 Entropy. 1.7 Irreversibility and Exergy. 1.8 Thermal cycles: engines and cooling. 1.9 Thermodynamic relations. 1.10 Mixtures and solutions. 1.11 Moist air. 1.12 Ideal solutions. 1.13 Chemical reactions. 1.14. Combustion. 1.15 Reaction entropy. 1.16 Chemical and phase equilibrium.

2. Fundamentals of Fluid Dynamics and Transport Phenomena

2.1 Physical properties of fluids. 2.2 Kinematics of the fluid particle. 2.3 Dynamics of the fluid particle: contact and field forces; ideal fluid: Euler equations and Bernoulli equation; real fluid: viscosity, viscous stresses, constitutive equations; Newtonian fluids. 2.4 Integral forms of fundamental laws applied to control volumes: conservation of mass, chemical species, momentum and moment of momentum. 2.5 Differential forms of fundamental laws. 2.6 Navier-Stokes equations, analytical solutions of the Navier-Stokes equations. 2.7 Potential Flow. 2.8 Boundary Layer and Boundary Layer Separation. 2.9 Drag Force: skin friction drag, form drag, wave drag. 2.10 Turbulence: transition from laminar flow to turbulent, boundary layer turbulence: wall law, universal logarithmic profile; Reynolds tensions, Boussinesq hypothesis, Prandtl's mixing length; Turbulence modeling. 2.11 Lift line theory. 2.12 Heat and mass transfer: conduction, convection, calculation of convective coefficients; boiling and condensation; radiation. 2.13 Compressible flow: one-dimensional flow, compressible two-dimensional flow; flow in gas turbines. 2.14 Numerical Methods in Computational Fluid Dynamics and Heat Transfer: computational linear algebra; Methods of Finite Differences, Finite Volumes and Finite Elements: solution of parabolic, hyperbolic and elliptic equations, implicit and explicit methods; boundaries with curvature and generation of computational meshes.

3. Applications of Transport Phenomena in Carbon Capture, Storage and Use

3.1 Introduction to fossil fuels: types, availability, emissions; topics related to secondary carbon emissions, for example, to the manufacture of cement, among others; examples: rock fracturing and oil drilling. 3.2. Carbon capture: combustion technologies for power generation; supercritical processes; fluidised beds; oxy-fuels, among others; capture technologies; gasification processes: gasification of solid and liquid waste. 3.3. Carbon storage: storage options and technologies; CO₂ storage in reservoirs: pore physics and reservoir engineering. 3.4. Gas reform: partial oxidation and other routes to the synthesis gas/hydrogen; routes for alternative liquid fuels - synthetic diesel, DME, biodiesel, Gas for Liquid - GTL. 3.5. Combined cycles, cogeneration, distributed generation.

Programmes based on the syllabus of the disciplines:

PME3240 Thermodynamics I

PME3341 Thermodynamics II

PME3230 Fluid Mechanics I

PME3330 Fluid Mechanics II

PME3556 Computational Fluid Dynamics

PME3361 Heat and Mass Transfer

PME3442 Compressible Flow Thermodynamics and Applications

PQI3203 Transport Phenomena I

PQI3301 Transport Phenomena II

PQI3303 Transport Phenomena III

The public tender will be governed by the provisions of the Statute and the General Rules of the University of São Paulo (USP) and the Rules of the Polytechnic College of USP:

1. Applications must be made exclusively through the link <https://uspdigital.usp.br/gr/admissao> in the period indicated above, and the candidate must submit an application addressed to the Director of the Polytechnic College of USP, containing personal data and area of expertise (specialty) of the Department to which it competes, attaching the following documents:

I - detailed *Curriculum Vitae* and proof of the published works, of the activities carried out pertinent to the public tender and other information that allows the evaluation of her/his merits, in digital format.

II - proof that he holds the title of PhD or Doctorate in Science or Engineering granted by USP, recognized by it or of national validity;

III - proof of discharge with military service for male candidates;

IV - voter's title;

V - voucher (s) of the last election, proof of payment of the respective fine or justification.

First paragraph: Proof elements of the *Curriculum Vitae* referred to in item I, such as models, works of art or other materials that cannot be digitized, shall be presented until the last working day preceding the beginning of the public examination.

Second Paragraph: Faculty Members holding positions at USP shall be exempt from the requirements referred to in items III and IV, provided that they have complied with them during their initial contract.

Paragraph Three: Foreign candidates shall be exempt from the requirements of items III, IV and V, and shall prove that they are in a regular situation in Brazil.

Paragraph Four: The foreign candidate approved in the public examination and indicated to the position can only be hired if he presents a temporary or permanent Visa that provides the exercise of remunerated activity in Brazil.

Fifth Paragraph: At the time of registration, applicants with special needs must submit a request to provide the necessary conditions for the performance of the exams.

Sixth Paragraph: At the time of registration, the foreign candidate may express in writing the intention to carry out the exams in the English language, in accordance with paragraph 8 of Article 135 of the General Rules of USP. The contents of the exams carried out in English and Portuguese will be identical.

2. The applications will be judged by the Congregation of the Polytechnic College of the University of São Paulo, in its formal aspect, publishing the decision in a written document.

Sole paragraph - The public examination shall be held within thirty to one hundred and twenty days, from the date of publication in the Official Gazette of the State of approval of the inscriptions, in accordance with article 134, sole paragraph, of the General Rules of USP.

3. The competition shall be carried out in accordance with objective criteria, in two stages, by means of the awarding of test scores, divided as follows:

1st phase (eliminary) - written exam

2nd phase:

- I) *Curriculum Vitae* with public evidence of argument
- II) Didactic Exam

First Paragraph: The convocation for the examination of those who applied for the position will be published in the Official State Gazette.

Second Paragraph: Candidates who are not present on the published dates will not be able to take the exams in other dates.

I - First phase: WRITTEN EXAM - Elimination character

4. The written test, which will deal with matters of general and doctrinal order, will be carried out in accordance with the provisions of art. 139, and its sole paragraph, of the General Rules of USP.

I - the judging committee will organize a list of ten points, based on the program of the public examination, and will inform the candidates twenty-four hours before the draw of the point, being forbidden the candidate to waive this period;

II - the candidate may propose the substitution of points, immediately after taking awareness of their statements, if she/he understands that they do not belong to the program of the public examination, being the responsibility of the judging committee to decide, on the plan, on the merits of the claim;

III - Once the point has been drawn, the non-extendable period of five hours of the exam begins;

IV - for 60 minutes, after the draw, it will be allowed to consult books, periodicals and other bibliographical documents;

V - the notes made during the consultation period may be used during the exam, and should be made on paper signed by the committee and attached to the final text;

VI - the evidence, which will be read in public session by the candidate, must be reproduced in copies that will be delivered to the members of the judging committee, when the session is opened;

VII - each event will be evaluated, individually, by the members of the judging committee;

VIII - will be considered qualified for the 2nd phase candidates who obtain, from the majority of the members of the judging committee, a minimum score of seven;

IX - the judging committee will present, in public session, the grades received by the candidates.

VIII - will be considered qualified for the 2nd phase candidates who obtain, from the majority of the members of the judging committee, a minimum score of seven;

IX - the judging committee will present, in public session, the grades received by the candidates.

5. Only the successful candidates in the first phase will participate in the second phase.

II - Second phase: PUBLIC EXAM OF ARGUMENTATION AND JUDGMENT OF CURRICULUM VITAE AND DIDACTIC EXAM

PUBLIC EXAM OF ARGUMENT AND JUDGMENT OF CURRICULUM VITAE

6. The judgment of the curriculum vitae, expressed by a global grade, including judgment and evaluation, shall reflect the merits of the candidate.

Sole paragraph - At the exam of curriculum vitae, the commission shall appreciate:

- I - scientific, literary, philosophical or artistic production;
- II - university didactic activity;
- III - activities related to the provision of services to the community;
- IV - professional or other activities, when applicable;
- V - diplomas and other university dignitaries.

DIDACTIC EXAM

7. The didactic exam will be public, with a minimum duration of forty and a maximum of sixty minutes, and will cover the program of the area of knowledge mentioned above, according to the terms of article 137 of the General Rules of USP.

- I - the judging committee, based on the public examination program, will organize a list of ten points, from which the candidates will know immediately before the draw of the point;
- II - the candidate may propose the substitution of points, immediately after learning those points mentioned in I, if she/he understands that they do not belong to the program of the public examination, being the responsibility of the judging committee to decide, the validity of the claim;
- III - the draw of the point will be done twenty four hours before the didactic exam, being forbidden to the candidate to waive this term;
- IV - the candidate can use the didactic material that he deems necessary;
- V - if the number of candidates requires it, they will be divided into groups of a maximum of three, observing the order of registration, for the purposes of drawing lots and conducting the exam.

SECOND PHASE EXAM

8. At the end of the assessment of the exams, each candidate will have from each examiner a final grade that will be the average of the grades awarded by her/him in both phases.

9. Exam grades may range from zero to ten to the first decimal place.

10. The grades obtained by the candidate approved in the written exam will compose the final average of the second phase.

11. The result of the public tender will be proclaimed by the judging committee immediately after its end, in public session.

12. Candidates who have obtained a minimum average grade of seven from the majority of examiners will be considered qualified.

13. The candidates qualified shall be nominated by each examiner, according to the grades awarded by her/him.

14. The candidate who obtains the highest number of nominations from the judging committee shall be nominated for the position.

15. The indication for the position of the named candidate shall be subject to the approval of a medical examination carried out by the Department of Medical Expertise of the State - DPME, pursuant to Article 47, VI of Law 10261/68.

16. The appointment of the candidate approved in the public tender, as well as the other resulting measures, shall be governed by the terms of Resolution 7271 of 2016.

17. The appointed faculty member in RDIDP shall maintain exclusive employment relation with USP, pursuant to Article 197 of the General Rules of USP.

18. The public tender will be valid immediately and only the candidate indicated for the position described above will be appointed.

19. The candidate will be summoned for the position by the Official State Gazette.

Further information, as well as the rules pertinent to the public tender, are available to those interested at the Collegiate Department of the Polytechnic College of the University of São Paulo, located at Avenida Professor Luciano Gualberto, travessa 3, nº 380, Cidade Universitária, São Paulo / SP, or by email svorcc.poli@usp.br and telephones (55 11) 3091-5447 / 3091-5225.