

**SELECTION PROCESS FOR ENTERING THE GRADUATE PROGRAM IN PHYSICS, IN THE AREA OF APPLIED PHYSICS, EMPHASIS ON COMPUTATIONAL PHYSICS, OF THE SÃO CARLOS INSTITUTE OF PHYSICS IN THE 1<sup>st</sup> SEMESTER OF 2018.**

The Postgraduate Commission (CPG) of the São Carlos Institute of Physics (IFSC), in using its powers stipulated in Article 39 of the USP Graduate Rules, makes public the opening of registration and sets standards for the admission selection process for the 1<sup>st</sup> semester of 2018 in the Graduate program in Physics, area of Applied Physics, emphasis on Computational Physics, Masters and PhD levels offered by the Physics Institute of São Carlos (IFSC), University of São Paulo (USP).

**1. GENERAL PROVISIONS**

1.1. The selection process for the Master and PhD in Computational Physics will consist of two steps: i) a written examination, of eliminatory and classificatory nature as specified in section 2 and ii) analysis of the academic merit as proved by documentation, as specified in section 10.

1.2. This selection process is open for candidates with a graduation diploma or those who graduated until the last day of the registration process.

1.3. Registration for written examination should be done following the instructions available at [http://www.ifsc.usp.br/~posgrad/exame\\_pg/inscricao\\_comp](http://www.ifsc.usp.br/~posgrad/exame_pg/inscricao_comp)

1.4. There is no fixed number of openings in the program and all the candidates that fulfill the requirements will be accepted.

1.5. In case of technical problems during the on-line registration, the candidate should try other Internet browsers. If this does not solve the problem, please contact [exam\\_pg@ifsc.usp.br](mailto:exam_pg@ifsc.usp.br)

**2 . WRITTEN EXAMINATION**

**2.1 Application:**

2.1.1. From July, 10<sup>th</sup> (starting at 09:00 Brasilia Time) to the August, 31<sup>st</sup> of 2017 (ending at 17:00 Brasilia Time), persons interested in admission to the program should register for the written examination at the Internet site [http://www.ifsc.usp.br/~posgrad/exame\\_pg/inscricao\\_comp](http://www.ifsc.usp.br/~posgrad/exame_pg/inscricao_comp)

2.1.2. For candidates that suggest another country (other than Brazil) for the exam, the registration will be validated until August, 25<sup>th</sup> 2017, 23:59 Brasilia Time. The candidate should verify the status of the registration after that. If the indicated professor validated the registration but the candidate did not receive the registration protocol it means that it was not possible to provide an exam in the suggested country.

2.1.3. We stress the process has a firm deadline for all the above mentioned steps, including validation by the supervisor and viabilization of the exam in another country, at August, 31<sup>st</sup> 2017, 17:00 Brasilia Time.

2.1.4. Candidates with special needs should contact [exam\\_pg@ifsc.usp.br](mailto:exam_pg@ifsc.usp.br) shortly after finishing the on-line registration.

2.1.5. Grades from previous IFSC selection processes, realized from 7 October 2015, are considered valid for this selection. Grades from these previous processes will be normalized according to section 4. Average grades for the IFSC previous exams will be available at [http://www.ifsc.usp.br/posgraduacao/index.php?option=com\\_content&view=article&id=190:processo-seletivo-fisica-aplicada-opcao-computacional-1-semester-2018-ingles&catid=9:uncategorised](http://www.ifsc.usp.br/posgraduacao/index.php?option=com_content&view=article&id=190:processo-seletivo-fisica-aplicada-opcao-computacional-1-semester-2018-ingles&catid=9:uncategorised)

2.1.6. Candidates who take the written examinations more than once will be considered, for purposes of inscription, only the grade from the last examination.

## 2.2 Contents of Exams:

2.2.1. The specific written exam for the Computational Physics emphasis will be composed of two parts with equal weights. The first part of the exam will contain 5 basic discursive questions in the area of physics and the second part will contain 5 basic discursive questions in the areas of Computational Physics, as specified in the program described in item 2.2.2. and 2.2.3 in this document. The candidate must answer the 10 questions with a value of 1.0 point each, making a maximum value of 5.0 points in the area of physics and 5.0 points in the areas of biological sciences and biochemistry. The candidates that has a grade zero (0,0) in any of the two parts of the examination (physical or Computational Physics) will be eliminated, irrespective of their performance on the questions of the other part.

2.2.2. **Physics:** a) Principles of Dynamics - Newton's laws and their applications; b) Conservation of Energy: Work of a constant force, a force working in the general case, conservative forces, conservation of energy in general movement applications: gravitational fields; c) oscillations: Simple harmonic oscillator (mass-spring system and simple pendulum), forced and damped oscillations; d) wave Motion: concept wave, harmonic waves, propagation, reflection and refraction; e) Introduction to Thermodynamics: heat and 1st Law; **Bibliography:** P. A. Tipler, Physics (volumes 1, 2 and 3), 5th edition, LTC Publisher, D. Halliday, R. Resnick, K. S. Krane, Physics (volumess 1, 2 and 4), 4th edition, LTC Publisher, R. A.

2.2.3 **Computer Science:** a) *Computer programming:* basic elements, control structures, arrays, functions and routines, structured development. Bibliography: Systematic Programming: An introduction, N. Wirth, Prentice-Hall; The C Programming Language, 2<sup>nd</sup> Edition, B. W. Kernigham & D. M. Ritchie, Prentice-Hall; Accepted languages for the answers: C, C++, Fortran, Pascal and Java. b) Algorithms and Data Structures: Sorting, basic data structures, graph algorithms. Bibliography: Introduction to Algorithms, 2nd edition., Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, MIT Press and McGraw-Hill; Fundamental Data Structures, E. Horowitz & S. Sahni, Computer Science Press. c) Numerical Methods:

interpolation and extrapolation, roots, FFT and applications. **Bibliography:** Numerical Recipes: The Art of Scientific Computing, William H. Press, Brian P. Flannery, Saul A. Teukolsky e William T. Vetterling, Cambridge University Press; Computational Physics, Nicholas J. Giordano e Hisao Nakanishi, Pearson Education; Computational Physics, Steven E. Koonin e Dawn C. Meredith, Addison Wesley.

### 3. APPLICATION

3.1. The written exam will take place on October, 18<sup>th</sup> 2017, from 14:00 to 17:00 (Brasilia Time), in the precincts of the IFSC-USP and in another in places to be disclosed at the site <http://www.ifsc.usp.br/~posgraduacao/> at least 15 days before the exam. The candidates are responsible for getting informed about the details through the site.

3.2. The candidates should choose for an application place during registration. Only the places displayed in the application form are allowed (except for overseas candidates). Requests for new places in another country can be done until August, 18<sup>th</sup> 2017, 23:59 Brasilia Time. After that, the option will be removed from the application form. Registrations that request another place will not be consolidated automatically but the result will be sent to the candidate until August, 25<sup>th</sup> 2017, 23:59 Brasilia Time. However, as the effective application of the exam in another country depends on the collaboration of other institutions unrelated with the IFSC-USP, the organizing committee cannot guarantee beforehand that it will be viable. If it not possible to arrange a place as requested until August, 25<sup>th</sup> 2017, 23:59 BRT, an official notification will be sent to the candidates. If they still have interest, they should then redo the registration, choosing one of the available places listed in the registration site, until the deadline of August 31<sup>st</sup> 2017, 17:00 BRT.

3.3. All candidates should be at their chosen exam places at least 30 minutes before the exam, with a valid penidentification document with photo, pencil, eraser and a pen (blue or black).

3.4. The questions can be answered either with a pencil or with a pen (blue or black).

3.5. No material in any form can be consulted during the exam, with the exception of what is contained in the exam. No electronic equipment, like calculators or cell phones, will be allowed.

3.6. At 60 minutes after the appointed starting time no new arrivals will be allowed.

3.7. Candidates can only leave the room after 90 minutes from the starting time.

3.8. Going to the bathroom is only allowed after 90 minutes from the starting time and in the company of an exam supervisor.

3.9. Extra paper for drafts will be given but in no circumstance will it be considered as part of the answers.

### 4. ASSESSMENT OF WRITTEN EXAMINATION

4.1. The grade for the exam to the emphasis in Computational Physics will be evaluated on a scale of 0 (zero) to 10 (ten) with an accuracy up to the second decimal place,

4.2. The grade will be normalized according to the following algorithm: let  $N_i$  be the grade of a candidate,  $N_{tot}$  the total number of students which took the specific exam for Computational Physics identified by letter

j. The average grade of the of exam j is defined as  $MCF_j = \frac{\sum_{i=1}^{N_{tot}} N_i}{N_{tot}}$ . The average grade  $MCF_j$  will be calculated with an accuracy up to the second decimal place.

4.3 The normalized grade of the candidate to be considered in this selection process is defined as  $NNorm_i = (N_i \times 5) / MCF_j$ . The grade  $NNorm_i$  will be calculated with an accuracy up to the second decimal place.

4.4 Candidate with  $NNorm_i$  equal to or larger than 4 (four) will be considered qualified in this selection procedure.

## 5. EVENTUAL CANCELLATION OF QUESTIONS

5.1. Eventual objections to questions of the exam should be sent to [exam\\_pg@ifsc.usp.br](mailto:exam_pg@ifsc.usp.br) within 3 working days after the exam. If adequately grounded and from a known sender the objection will be analyzed by the CPG. If the objection is considered valid, the question will be abrogated, the associated points discarded and the maximum possible grade normalized to 10.00. No recourses will be accepted if:

- a) There is no exposition of the grounds under which the question is considered invalid.
- b) The objection is sent outside the specified time.

5.2. After the deadline for objections, the organizing committee will analyze them and send a response regarding their acceptance or rejection. In case of a rejection, the response will include a consubstantiated opinion justifying the rejection.

## 6. DISCLOSURE OF THE RESULTS

6.1. The deadline for the disclosure of the results is November, 16<sup>th</sup> 2017.

## 7. REVISION OF THE GRADES

7.1. After the grades are disclosed, candidates can request revisions of the corrections. This should be done in two steps. At most 3 working days after disclosure of the grades the candidates should manifest their interest in seen the correction of the exam by sending an email to [exam\\_pg@ifsc.usp.br](mailto:exam_pg@ifsc.usp.br). The organizing committee will then send, in at most 3 working days, an electronic copy of the exam with corrections to the electronic address given at registration. The candidate will have then a 3 working days deadline to submit a request for revision to [exam\\_pg@ifsc.usp.br](mailto:exam_pg@ifsc.usp.br). The request must be based on the official answers and

correction criteria that will be available at <http://www.ifsc.usp.br/~posgraduacao/>, including a brief and clear justification of the necessity of alteration of the grade. Requests will **not** be considered if:

- a) They do not have a clear exposition of the reasoning why the candidate considers the grade wrong.
- b) They are submitted after the deadline.

7.2. After the deadline, the organizing committee will consider all submitted change requests and inform the interested parties of the result through electronic address given at registration.

## **8 . REGISTRATION IN THE MASTER AND PhD PROGRAMS IN APPLIED PHYSICS, EMPHASIS IN COMPUTATIONAL PHYSICS AT IFSC**

8.1 Candidates should register in the period between the 06<sup>th</sup> and 15<sup>th</sup> December 2017, at the "Serviço de Pós-Graduação" of IFSC-USP, from Monday until Friday, from 09:30 to 11:30 BRT and from 14:00 to 16:00, excluded holidays at the address:

Instituto de Física de São Carlos - IFSC/USP  
Serviço de Pós-Graduação  
Avenida Trabalhador São-carlense, 400  
Parque Arnold Schimidt  
CEP: 13566-590  
São Carlos - SP, Brazil

8.2 Registrations can be made in person or by post. Entries sent through the Post Office must be postmarked by the last day of registration, by Express Post (SEDEX, FEDEX, DHL, or similar) method or equivalent method, in the case of candidates from other countries, and will only be valid if received by Graduate Office of IFSC by the fifth business day after the close of entries .

## **9. DOCUMENTS REQUIRED FOR REGISTRATION**

9.1 Upon registration, applicants must submit the following documents:

Application Form (available in the graduate page, in the IFSC <http://www.ifsc.usp.br/~posgraduacao/> Portal, the **General** item, sub item **Forms**);

- a) Copy of CPF and identity card (RG) to Brazilian candidates;
- b) Copy of ID or Passport/RNE for foreign applicants (or protocol);
- c) Copy of Voter Registration, Certificate of Reservist for Brazilian candidates;
- d) Copy of proof of military service discharge certificate, Reservist, for Brazilian male candidates;
- e) Copy of Birth Certificate and, where applicable, Marriage Certificate; for Brazilian and foreign candidates
- f) Copy of the transcript of undergraduate, even if incomplete for recently graduated students;
- g) Copy of the transcript of the masters for PhD candidates;
- h) Lattes/CNPq CV (for Brazilian candidates or foreigners who have their data included in this platform) or Curriculum Vitae (for foreign applicants), duly recorded;

- i) Candidates for the doctoral course should submit a concise Research plan of a minimum 5 and a maximum of 20 pages, size A4 typed in Arial font size 12, the first page should contain only the title of the work, name and signature of the applicant and the name and signature of the supervisor;
- j) Results of the written exam for the Applied Physics, emphasis on Computational Physics.

## 10. SELECTION CRITERIA FOR APPLICANTS

10.1 Candidates qualified in the written examination and that submitted the required documentation for registration in the graduation program of IFSC-USP will be ranked according to the normalized grade of the written exam (**NNormi**) and the analysis of academic merit based on the documentation as explained below.

10.2 For the selection of candidates for the Master program, the normalized score (**NNormi**) will receive a weight equal to 8 (eight) and the analysis of academic merit will receive a weight 2 (two):

10.3 For the selection of candidates for the PhD, the normalized score (**NNormi**) will receive a weight equals to 7 (seven) and the analysis of academic merit will receive a weight 3 (three):

10.4 For the candidates for the Master program, the following criteria will be used in the evaluation of the academic merit: I) the transcript of the undergraduate program, taking into account the academic performance of the candidate and ii) Curriculum Lattes printed and documented (in the case of Brazilian candidates) or Curriculum Vitae printed and documented (for foreign applicants), by taking into account the scientific production of the candidate using the grading bellow.

- Author of scientific paper in international journal with referees and editorial board (2 points).
- Author of scientific paper in national journal with referees and editorial board (1 points).
- Author of abstract presented at international congresses (0.25 points).
- Author of abstract presented at national congresses (0.15 points).
- Participation in projects of Scientific Initiation, with fellowship support for a minimum period of 6 months (0.5 points) and 1 year (1 point).
- Conducting stage without fellowship support for a period longer than 3 (three) months (0.25 points).

10.5 For the candidates for the PhD program, the following criteria will be used in the evaluation of the academic merit: Curriculum Lattes printed and documented (in the case of Brazilian candidates) or Curriculum Vitae printed and documented (for foreign applicants), by taking into account the scientific production of the candidate using the grading bellow:

- Author of scientific paper published as a result of the Master dissertation\*\*:
  - a) in international journal with referees and editorial board (3 points).
  - b) in national journal with referees and editorial board (2 points).
- Author of scientific paper:
  - c) in international journal with referees and editorial board (2 points).
  - d) in national journal with referees and editorial board (1 point).
- Full paper presented at the congress during the master project (0.5 point).
- Author of abstract presented at international congresses during the Master project (0.25 points).
- Author of abstract presented at national congresses during the Master project (0.15 points).

\*\* In order to prove that the article originates from his Master's dissertation, the student must also present a document containing the Title and the Summary of his Master's dissertation containing the student and his advisor signature.

10.6 In light of these analyzes, students will be ranked according to their scientific performance in undergraduate and graduate activities.

10.7 In case of tie between candidates, the following tiebreaker order will be followed:

10.7.1 For candidates for the Master program:

- Number of scientific papers in international journal with referees and editorial board
- Number of scientific papers in national journal with referees and editorial board
- Number of abstracts presented at international congresses
- Number of abstracts presented at national congresses

If the tie still persists, it will be considered the weighted average grade obtained during its undergraduate course, which will be evaluated through the School records presented at the time of its enrollment.

10.7.2 For candidates for the PhD program:

- Sum of the impact factor of the scientific papers in international journal with referees and editorial board
- Sum of the impact factor of of scientific papers in national journal with referees and editorial board
- Number of abstracts presented at international congresses
- Number of abstracts presented at national congresses

If the tie still persists, the value of the impact factor of articles published as author in international journal with arbitration and editorial board as will be considered.

10.8 We clarify that no interview in the selection process of applicants and that the entire process of selection is conducted by the Graduate Studies Committee in Physics IFSC-USP, advised by teachers connected to IFSC and registered in the graduate program, representing all areas of concentration the program.

## **11. DISCLOSURE OF FINAL RESULT**

The final result of the selection process will be announced until January, 12<sup>th</sup> 2018, through the portal <http://www.ifsc.usp.br/~posgraduacao/> in the item "Processo Seletivo".

## **12. ENROLLMENT**

On the enrollment period, defined in the University of São Paulo Graduate calendar and published along with the final outcome of the selection process, the selected candidate should enroll in the Graduate Office, delivering the following documentation:

### 12.1 Master Degree Course:

i) Registration Forms, Declaration of Compulsory Courses, Choice of Advisor and Medical Assistance, duly completed and signed (available in the Graduate page, in the IFSC Portal: <http://www.ifsc.usp.br/~posgraduacao/> in the item selection process , subsection Filename);

ii) A copy of the undergraduate certificate, duly registered or a certificate of under graduation with the date of completion of undergraduate degree, containing the under graduation date, obtained in **officially recognized** course. Will not be accepted for this purpose on short diploma degree, except in special cases of academic merit, demonstrated by Committee specifically constituted by the Board of Standards and Appeals and approved by the Board of Graduate Studies, USP ;

iii) A copy of the full transcript of the undergraduate course. **Note:** If the candidate has already given copy of the full transcript of graduation upon registration, item 9.1 f), this item should be disregarded .

iv) The candidates unable to prove they finished the undergraduate course before the deadline of the enrollment period will not be able to complete the registration in the program.

### 12.2 Doctorate Degree Course:

i) Registration Forms, Declaration of Compulsory Courses, Forms Choice of Advisor and Form of Medical Assistance, duly completed and signed (available in the Graduate page, in the IFSC Portal: <http://www.ifsc.usp.br/~posgraduacao/> in the item "Processo Seletivo", subsection Matrícula);

ii) A copy of the undergraduate certificate, duly registered or a certificate of under graduation with the date of completion of undergraduate degree, containing the under graduation date, obtained in officially recognized course. Will not be accepted for this purpose on short diploma degree, except in special cases of academic merit, demonstrated by Committee specifically constituted by the Board of Standards and Appeals and approved by the Board of Graduate Studies, USP ;

iii) A copy of the Master Degree Diploma or certificate of Dissertation Defense, duly approved and issued by the competent body.

iv) A copy of the full transcript of the undergraduate course and another of the graduate course (Master Degree Level). **Note:** If the candidate has already given copy of the full transcript of graduation upon registration, item 9.1 f), g), this item should be disregarded.

**12.3** It is allowed the enrollment of a candidate that holds a Master degree, duly recognized by CAPES, with a certificate of defense and the official course recognition ordinance, for Brazilian degrees. **Brazilian or foreign candidates that hold a master degree obtained from foreign Universities must obtain, previous to enrollment, the equivalence of its master degree title by the University of São Paulo.**

### ADDITIONAL INFORMATION:

Additional information and further clarification may be obtained at the Graduate Office IFSC, located at Av-trabalhador SaoCarlense, 400 - Centro - 13566-590 - São Carlos, SP, phone: (16) 3373-9777 / 9589 / 8808, the portal of the IFSC: [www.ifsc.usp.br](http://www.ifsc.usp.br); Postal: PO Box 369, ZIP code 13560-970, São Carlos, SP, Brazil, or by e-mail at: [exam\\_pg@ifsc.usp.br](mailto:exam_pg@ifsc.usp.br).