NOTICE

The Coordinations of the Graduate Programs in Physics of the following institutions:

- Instituto de Física - USP
- Instituto de Física de São Carlos - USP
- Instituto de Física “Gleb Wataghin” - UNICAMP
- Instituto de Física Teórica - UNESP
- Universidade Federal do ABC - UFABC
- Universidade Federal de São Carlos - UFSCar
- Universidade Federal do Rio Grande do Sul - UFRGS
- Universidade Federal de Minas Gerais - UFMG
- Universidade Federal de Pernambuco – UFPE
- Universidade Federal do Rio Grande do Norte – UFRN

make public the opening of registrations and establish norms for the

Unified Examination of Graduate Courses in Physics – EUF 2-2020

The individual results of the Unified Examination of Graduate Courses in Physics - EUF may be used as part of the selection process for admission to the Graduate Programs in Physics of the following universities and Brazilian institutions associated with the EUF:

- IAG - Instituto de Astronomia e Geofísica da USP, São Paulo, SP
- ITA - Instituto Tecnológico da Aeronáutica, São José dos Campos, SP
- INPE - Instituto Nacional de Pesquisas Espaciais
- UEL - Universidade Federal do Litoral, PR
- UEPG - Universidade Estadual de Ponta Grossa, Ponta Grossa, PR
- UESC - Universidade Estadual de Santa Cruz, PROFISICA, Ilhéus, BA
- UFABC - Universidade Federal do ABC, Santo André, SP
- UFAM - Universidade Federal do Amazonas, AM
- UFES – Universidade Federal do Espírito Santo, Vitória, ES
- UFG - Universidade Federal de Goiás, GO
- UFLA - Universidades Federais de Lavras, MG
- UFMG - Universidade Federal de Minas Gerais, Belo Horizonte, MG
- UFMT - Universidade Federal do Mato Grosso, Cuiabá, MT
- UFPJ - Universidade Federal do Paraíba, Belém, PA
- UFPE - Universidade Federal de Pernambuco, Recife, PE
- CBPF - Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro, RJ
- UERJ - Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ
- UFF - Universidade Federal Fluminense, Niterói, RJ
- UFBA – Universidade Federal da Bahia, Salvador, BA
- UFPR - Universidade Federal do Paraná, Curitiba, PR
- UFRN - Universidade Federal do Rio Grande do Norte
- UFRGS - Universidade Federal do Rio Grande do Sul, RS
- UFSC - Universidade Federal de Santa Catarina, SC
- UFSCar - Universidade Federal de São Carlos, São Carlos, SP
- UFU - Universidade Federal de Uberlândia, MG
- UNB - Universidade de Brasília, DF
- UNESP - Universidade Estadual Paulista, IGCE, Rio Claro, SP
- UNESP - Universidade Estadual Paulista, IFT, São Paulo, SP
- UNICAMP - Universidade de Campinas, IFGW, Campinas, SP
- UNILA - Universidade Federal da Integração Latino-Americana, Foz do Iguaçu, PR
- UNICRISTAL - Universidade Cruzeiro do Sul, SP
- UNIFEI - Universidade Federal de Itajubá, MG
- USP - Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP
- USP - Universidade de São Paulo, IFSC, São Carlos, SP
- USP - Universidade de São Paulo, IFUSP, São Paulo, SP
- UFPR - Universidade Federal do Paraná, Curitiba, PR
- UFU - Universidade Federal de Uberlândia, MG
- UFV - Universidade Federal de Viçosa, Viçosa, MG

Detailed information on the Unified Examination of Graduate Courses in Physics relevant to the **EUF 1-2020** edition will be exclusively available via the internet, through the

EUF PLATFORM in [www.ufrgs.br/euf](http://www.ufrgs.br/euf).
Only through the Platform can the candidate, among other things, access this Notice, carry out his/her registration and place demands/requests that he/she deem pertinent. The candidate will also have access to his/her own portal (see instructions for access at the end of this notice), which will include personal data, proof of registration and results obtained in the exam, among others. All requests will be answered by the EUF Committee only via the EUF Platform and in line with the schedule of events of this announcement, detailed below.

CONCERNING REGISTRATIONS

Registrations will be open from January 20 to February 16, 2020, and must be made via the EUF Platform.

ATTENTION: registrations for those requesting fee exemption, special needs assistance or an alternative location for exam application, can only be made AFTER the conclusion of the request appraisal by the EUF Committee. Therefore, the applicant must wait for the response before doing his/her registration.

REGISTRATION FEE

The EUF registration fee, in the amount of R$100.00, must be paid only by credit card or bank slip (in Brazil, and in this case, it cannot be made by appointment), according to the instructions on the registration page. Under no circumstances will this fee be refunded.

The candidate is responsible for knowing bank opening and closing hours in order to proceed payment, either by visiting the bank (sites, bank agencies, Brazilian lottery houses or any other payment places), or by online banking (internet or cashpoint). Registration fees paid on the last day and that are in disagreement with the bank operating hours, therefore resulting in the processing of the payment in days after February 17, 2020, will cause the non-homologation of the registration. Under no circumstances, will SBF* process any payment record with a date subsequent to that provided in the Schedule of this Notice.

The candidate, to whom was not granted the exemption of the registration fee, will have their registration homologated only after SBF receives the confirmation of the payment of the registration fee from the Banks or credit card operators.

EXEMPTION FROM REGISTRARION FEE: Candidate which monthly family income is up to one and a half of Brazilian minimum salary per person, can request exemption from the registration fee. Requests for exemption must be submitted through the EUF Platform from January 20 to February 07, 2020. Requests for exemption will only be accepted with supporting documentation. The results of the requests for exemption will be communicated to the applicant through the EUF Platform until February 11, 2020, and only then the candidate must proceed with registration, observing the February 16, 2020 deadline.

EXAM LOCATIONS: The Exam will be held simultaneously at the locations indicated on the registration page. The candidate must choose only one of these locations at the time of his/her registration. Once the application has been homologated, the candidate cannot change the selected location.

The establishment of a new location for application of the EUF Exam, in addition to the places available on the registration page, will not be allowed, except abroad in case there are demands that justify the request. Candidate who wishes to request a new place of application of the tests abroad, must submit this request via the EUF Platform between January 20 and February 04, 2020. The Committee will make efforts to make the suggested location feasible until February 11, 2020. By this deadline, the candidate must verify in the EUF Platform if the new requested location has been made available. If the requested location has not been made available by this date, this will be the official indication of the impossibility of applying the exam at the requested location. In that case, the candidate should select one of the available locations, if he/she still has interest.

SPECIAL NEED ASSISTANCE: Candidate with special needs (physically handicapped or with reduced mobility) must ask for the viability of the service, through the EUF Platform, between January 20 and February 07, 2020.
ATTENTION: the registration in the exam should be done only after the positive response of the EUF Committee, which must occur until February 11, 2020. In case of impossibility of attendance, the candidate will be notified by the organization, with detailed justifications.

Registration of any candidate who requested special needs provisions, made before the response by the EUF Committee, may not be homologated and the registration fee will not be returned in this case.

The application process has a deadline of February 16, for all applicants, including those who requested a fee waiver, and/or special needs assistance, and/or a new location to take the tests.

On February 24, 2020 the preliminary list of candidates enrolled in the EUF 1-2020 will be announced. Candidates who have completed the registration and are not on the list, must report it by February 26, 2020, through the EUF Contact - Coordination option, available on the EUF Platform, in order to rectify their situation.

The final and approved list of participants will be published on March 03, 2020.

CONCERNING THE EXAMS

The selection exam will be carried out in two stages (exams), on March 31st and April 1st, 2020 from 2:00 p.m. to 6:00 p.m. (Brasilia time zone), in the locations published in the EUF Platform. The candidate may take the exams in one institution and register for selection in the Graduate Programs of other institutions.

The candidate must attend the place of the exams with an identity document with photo and carry a blue pen. The exams will be scanned for correction, so the use of a blue pen is mandatory. Exams that do not allow clear, readable scanning will not be corrected. Draft sheets will be provided, but will NOT be considered for proofreading. The use of a calculator and other electronic equipment such as cell phones, tablets, computers and calendars will not be allowed. The exams will consist only of discursive questions. A table with some formulas and physical constants will be provided for use during the exams. No other source of information is allowed.

CONCERNING THE CONTENTS OF THE EXAMS

The exams will cover five general areas of the Undergraduate Programs in Physics, namely,

1. Classical Mechanics
2. Electromagnetism
3. Modern Physics
4. Quantum Mechanics
5. Thermodynamics and Statistical Physics.

The topics of each area to be evaluated and the recommended bibliography are as follows:

1. CLASSICAL MECHANICS
   • Newton Laws.
   • One-dimensional motion.
   • Linear Oscillations.
   • Movement in two and three dimensions.
   • Newtonian gravitation.
   • Variational calculus.
   • Lagrange and Hamilton’s equations.
   • Central forces.
   • Systems of particles.
   • Non-inertial reference frames.
   • Dynamics of rigid bodies.
   • Coupled oscillations.
2. ELECTROMAGNETISM

- Electrostatic fields in vacuum and dielectric materials.
- Resolution of equations of Poisson and Laplace.
- Magnetic fields, stationary currents and non-magnetic materials.
- Induced electromotive force and magnetic energy.
- Magnetic materials.
- Maxwell’s equations.
- Propagations of electromagnetic waves.
- Reflection and refraction.
- Radiation.
- Electromagnetism and Relativity.

Bibliography:
- E.M. Purcell, Curso de Física de Berkeley, Eletricidade e Magnetismo, Edgard Blücher.

3. MODERN PHYSICS

- Foundations of special relativity.
- Relativistic mechanics of particles.
- Light propagation and Newtonian relativity.
- Experiment of Michelson and Morley.
- Postulates of the special theory of relativity.
- Lorentz’s transformations.
- Causality and simultaneity.
- Relativistic energy and momentum.
- Thermal radiation, the black-body problem and Planck’s postulate.
- Photons and corpuscular properties of radiation.
- Rutherford’s model and the problem of atomic stability.
- Bohr’s model.
- Boltzmann’s energy distribution.
- Atoms, Molecules and Solids.

Bibliography:
- H.M. Nussensveig, Curso de Física Básica IV, (capítulo 6), Edgard Blücher.
4. QUANTUM MECHANICS

- Introduction to the fundamental ideas of quantum theory.
- The mathematical apparatus of Schrödinger’s quantum mechanics
- The one-dimensional harmonic oscillator.
- One-dimensional potentials.
- Schrödinger’s equation in three dimensions. Angular momentum.
- Central forces and the hydrogen atom.
- Spinors in non-relativistic quantum theory.
- Coupling of angular momenta.
- Time-independent perturbation-theory.
- Identical particles.

Bibliography:

5. THERMODYNAMICS AND STATISTICAL PHYSICS

- Thermodynamic systems.
- Variables and equations of states, PVT diagrams.
- Work and the first law of thermodynamics.
- Mechanical equivalent of heat.
- Internal energy, enthalpy, Carnot’s cycle.
- Changes of phase.
- Second law of thermodynamics and entropy.
- Thermodynamic functions.
- Practical applications of thermodynamics.
- Kinetic theory of gases.
- Statistical description of a physical system.
- Micro canonical ensemble.
- Canonical ensemble.
- Classical gas in the canonical formalism.
- Gran canonical ensemble.
- Quantum ideal gas.
- Fermi’s ideal gas.
- Bose-Einstein’s condensation.

Bibliography:
- H.B. Callen, Thermodynamics ,Wiley, 1960
- R. Kubo, Statistical Mechanics, North-Holland, 1965
CONCERNING THE IMPUGNATION OF THIS NOTICE

Any objection to any aspect of this NOTICE must be posted on the EUF Platform within 3 days of its publication in the Brazilian Diário Oficial da União. Provided that it is duly supported and forwarded by an identified sender, the arguments will be analyzed by the Organizing Committee.

Demands for objections will not be accepted:
   a) without clear and detailed explanation of the applicant’s non-conformities;
   b) filed after deadline.

Once the deadline for submitting objections has been reached, the Organizing Committee will analyze them and send the applicant a response regarding its acceptance or rejection. In the event of verification that the basis for the request contesting the EUF Notice is pertinent, the Organizing Committee shall take the necessary measures to correct the Notice.

CONCERNING THE IMPUGNATION OF QUESTIONS

Any objection to any EUF question should be posted on the EUF Platform within 3 days of the completion of each event. Provided that it is duly supported and forwarded by an identified sender, the arguments will be analyzed by the Organizing Committee.

No appeal will be allowed:
   a) without applicant’s clear reasoning;
   b) filed after deadline.

After the deadline for questions issues submission, the Organizing Committee will analyze them and send the applicants a response regarding their possible acceptance or rejection.

In the event of annulment of an EUF question, the corresponding score will simply be discarded and the remaining scores will be normalized in such a way that the maximum possible score is 10.00.

CONCERNING EXAM CORRECTION AND THE ANNOUNCEMENT OF THE RESULTS

The exams will be corrected in accordance with the Official Solutions Template and Correction Criteria, which will be made available on the EUF Platform after the grade’s publication. To each candidate will be awarded a final score from 0 to 10, up to the second decimal place, reflecting their performance on the exam.

On May 18, 2020 the final results of the exam will be posted at the candidates’ portal on the EUF Platform through which the voucher of the scores obtained on the exam can be accessed.

CONCERNING REVISION OF THE SCORES

After the correction of the exams and the disclosure of the results, the candidate can appeal by questioning the scores per question attributed to him/her, duly justified in writing. To do this, the candidate must proceed in two stages:

1) Within three days of the release of the results, the candidate can express his/her wish to see the corrected tests by posting the application on the EUF Platform, in order to compare them with the Official Solutions Template. The Organizing Committee will then post electronic copies of the corrected exam on the candidate’s portal on the EUF Platform up to May 24, 2020.

2) The candidate has the option to submit a review request of his/her score, upon posting it on the EUF Platform up to May 25, 2020. The request must: a) be based on the Official Solutions Template and Correction Criteria previously disclosed; b) present, for each item of each question whose correction is being questioned, clear and concise justifications that show the need to change the correction.

No request will be admitted:
a) without the detailed and justified explanation, for each item of each question whose correction is being questioned, of the reasons for the nonconformity of the candidate. In particular, generic and vague review requests will not be considered

b) filed after deadline.

Upon completion of the period of appeal for revision of results, the Organizing Committee will analyze the appeals. Once this reviewing stage is over, the claimants will be informed of the result and the revised check of scores will be available at their portals, on the EUF Platform, until June 04, 2020.

ATTENTION: When choosing to review scores, the candidate's voucher, issued on May 18, 2020, will be automatically invalid. A new valid voucher, for use with the Graduate Programs Associated with the EUF, will be the one that can be accessed by the candidate (and by the Associated Programs) from June 04, 2020 on.

CONCERNING THE USE OF THE RESULTS

Each Associate Graduate Program will use the results in the Exam for the selection and classification of the candidates according to its own criteria. Acceptance or non-acceptance in one Program does not imply acceptance or non-acceptance in another Program. The Associates must access the EUF Platform and extract an individualized and certified proof of the scores obtained by the candidate who is seeking entry into their Program.

CONCERNING THE APPLICATION OF THE EXAMS

- The complete process will consist of two exams, applied on March 31st and April 1st, 2020.
- The candidate must appear at the place of the exams, each day, at least 30 minutes in advance for checking documents and signing the attendance list, with an ID with photo.
- The tests offered to the candidate will only be in Portuguese or English, according to his/her choice made at the time of registration.
- The exams must be made mandatorily with blue ink pen, as they will be scanned for correction; exams that do not allow clear and readable scanning will not be corrected.
- Under no circumstances will draft sheets be considered in the correction of the exams.
- Each question should be solved solely and exclusively on the response sheet it has designated; solutions outside the designated spaces will not be considered.
- The answers to questions can be written in Portuguese, English or Spanish.
- Each exam will last four (4) hours starting at 2:00 p.m. (Brasília time).
- It will not be allowed to consult any material other than that contained in the exam’s sheets.
- The use of a calculator or any other electronic equipment such as cell phones and calendars will not be allowed.
- The candidate will not be allowed to enter the room after 60 minutes from the start time.
- The candidate will only be allowed to leave the room definitively after 90 minutes of the start time of the tests.
- The candidate can go to the toilet only after 90 minutes of the start time of each test and with a room supervisor.
CONCERNING THE SCHEDULE OF THIS NOTICE

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CONCERNING THE ORIENTATIONS TO ACCESS THE CANDIDATE PORTAL IN THE EUF PLATFORM

First, the candidate must enroll at the website www.ufrgs.br/euf, entering all requested personal data, especially the candidate must register a password that will allow future access to his/her Portal.

Through the ACCESS button, available in the upper right corner of the Platform page (by entering LOGIN and PASSWORD), the candidate will have access to the registration certificate and to all other information that is generated during the course of the EUF 1-2020 edition that concerns him/her, including the grades obtained after the exam is proofread.

If there are technical problems at the time of registration (or a posteriori), users should try to use other internet browsers and always enable Pop-Ups.

All information relevant to EUF 1-2020 will be available on the portal and all communication between candidate and the EUF Committee should be exclusively done through the PLATFORM.

CONCERNING GENERAL PROVISIONS

* The Sociedade Brasileira de Física – SBF – will be responsible for the processing and verification of registrations payments.

Exams will be discarded 2 months after the disclosure of the results of appeals by candidates who have questioned their scores.

Registration in the EUF does not imply that the applicant is automatically enrolled in any of the Graduate Programs associated with the examination. The candidate must register separately in the Graduate Programs of the Institutions of his/her interest. Applications to Programs must be made according to the specific rules of each Institution and within the deadlines required by them. This information is available on the webpages of each Program.