

# **Ph.D. In PHYSICS**

## **Admission Procedure**

- (1) **Eligibility:** They should have qualified **GATE** (M.Sc.), **JEST** (M.Sc., B.Sc.), **CSIR** (M.Sc., we will accept students only with JRF), **TIFR** (M.Sc., B.Sc.)
- (2) **Shortlisting:** Applicants will be shortlisted based on their performance (**Rank / Percentile**) in the above mentioned entrance tests.
- (2) **Final Selection:** Shortlisted candidates will be finally selected for admission in the Ph.D. program based on their performance in the entrance test followed by an interview that will be conducted by the Department of Physics, NISER.

## **Syllabus**

**If students are joining the Ph.D. Program after M.Sc.:**

### **Course Work**

There will be two semester course work in which the students will be taking six core courses: four in their 1<sup>st</sup> semester and two in the 2<sup>nd</sup> semester. During the second semester they have the choice of taking two courses out of three. All will be four credit courses. There will be no laboratory courses for these students. The details of the courses are outlined below.

#### **First Semester:**

- (a) P501: Electromagnetism II (4)
- (b) P502: Statistical Mechanics (4)
- (c) P503: Quantum Mechanics II (4)
- (d) P701: Classical Mechanics II: Mechanics of Continuous media (4)

#### **Second Semester:**

The student will choose two courses out of the following three.

- (a) P601: Atoms, Molecules and Radiation (4)
- (b) P602: Introduction to condensed matter physics (4)
- (c) P603: Nuclei and Particles (4)

#### **Course Exemption:**

If the student has already taken some courses that are there in the Ph.D. course work beforehand then those courses will be waived depending upon the student's performance in the written test which will be conducted by the concerned teacher taking the course at that point of time. It will be four hours examination like the end semester examination and the student should secure more than 75% marks for course exemption.

### **Qualifier**

This will comprise of a written test followed by an interview which the students must qualify so as to start his/her research career. Once they have qualified, its time for them to credit at least two elective courses (they can even credit more number of elective courses) depending upon their choice to work on a specialized research area. After the qualifier the students are ready to decide their Ph.D. supervisor.

#### **List of Elective Courses:**

- (a) P702: Advanced Solid State Physics. (4)
- (b) P703: Astronomy and Astrophysics. (4)
- (c) P704: Computational Physics. (4)
- (d) P705: Quantum Field Theory I (4)
- (e) P801: Particle Physics (4).
- (f) P802: Introduction to Phase transitions and Critical phenomena (4)
- (g) P803: Plasma Physics and Magneto hydrodynamics. (4)
- (h) P804: Biophysics. (4)
- (i) P805: Nonlinear optics and laser (4).
- (j) P901: General Relativity and Cosmology (4).
- (k) P902: Soft Condensed Matter (4)
- (l) P903: Applied Nuclear Physics. (4)
- (m) P904: Many Particle Physics. (4)
- (n) P905: Quantum- and Nano- electronics (4).
- (o) P1002: Nonlinear Physics, Chaos, Turbulence. (4)
- (p) P1003: Theory of Magnetism and Superconductivity (4)
- (q) P1004: Density functional theory of atoms molecules and solids (4).
- (r) P1005: Quantum field theory II (4)

#### **If students are joining the Ph.D. Program after B.Sc.:** (Exceptional cases)

Following is the tentative plan for students getting selected for the Ph.D. program just after their B.Sc. and we will be coming up with the actual plan shortly.

### **Course Work**

There will be two years of course work in general for these students. During the first year of their course work they will be taking some core courses along with laboratory courses.

All will be four credit courses. After the first year the rest of the procedure is same as that which the department of Physics will be following for students joining Ph.D. after M.Sc. Details of the first year course work are mentioned below.

**First Semester:**

- (a) P301: Classical Mechanics (4)
- (b) P302: Mathematical Methods I (4)
- (c) P303: Quantum Mechanics I (4)
- (d) PL301: Physics Lab (2)
- (e) PL302: Physics Lab (2)

**Second Semester:**

- (a) P401: Electromagnetism I (4)
- (b) P402: Mathematical Methods II (4)
- (c) P403: Electronics (4)
- (d) PL401: Physics Lab (2)
- (e) PL402: Physics Lab (2)

**Course Exemption:**

If the student has already taken some courses that are there in the Ph.D. course work beforehand then those courses will be waived depending upon the student's performance in the written test which will be conducted by the concerned teacher taking the course at that point of time. It will be four hours examination like the end semester examination and the student should secure more than 75% marks for course exemption.

**Possibility of obtaining the M.Sc. degree**

It's quite trivial that students who have enrolled in the Ph.D. program after their B.Sc. degree might decide to quit the program just after completing two years of course work. In such case the student will go out of NISER with the M.Sc. degree. In any case the student should be getting the M.Sc. degree after two years of course work no matter whether he/she will continue/quit the Ph.D. program.