



**Isfahan
University of
Technology**

Department of Physics

In The Name of God

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Overview

Faculty of Physics, founded in 1977, offers educational and research opportunities ranging from Bachelor of Science to Doctor of Philosophy in Condensed Matter, High Energy Physics, and Nuclear Physics.

There are 27 affiliated faculty members and about 231 graduate students (masters and PhD) and 7 post-docs at this Department. The research atmosphere is quite active nationally as one of the leading schools in natural science. The Department of Physics is in active collaboration and contact with several international research and scientific centers, including European Council for Nuclear Research and the European Quantum Flagship, ICRA Net, and INFN. Meanwhile, with 247 undergraduate students, it presents a lively environment.

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Department of Physics



Degree Programs

■ B.Sc

- 135 Course Credits including 3 optional credits for an undergraduate project course.
- Specialized courses such as Biophysics, Quantum optics, Superconductivity, Solid-state Physics, Nuclear physics, Particle accelerators, Astrophysics, Thin films, Nanophysics, Elementary particle physics, Electronics, and Laser physics, Plasma Physics, Special Relativity Detectors, Reactor Physics.

■ M.Sc

Condensed-matter physics:

- 22 Course Credits + 6 Thesis credits
- In various research fields: Experimental Magnetic Materials ,Nano Sensor, Complex Systems, and Computational Condensed-Matter.

High-energy physics:

- 22 Course Credits + 6 Thesis credits
- With the opportunity to perform high level research on Astrophysics, Gravitation and Cosmology, Theoretical and Experimental Particle Physics.

Nuclear physics:

- 23 Course Credits + 6 Thesis credits
- In various research fields: Nuclear Fusion, Accelerator Physics, Physics of Nuclear Radiotherapy and Strong Interaction.



■ Ph.D

Condensed-matter physics:

- *16 Course Credits + 20 Thesis credits*

High-energy physics:

- *16 Course Credits + 20 Thesis credits*

Nuclear physics:

- *16 Course Credits + 20 Thesis credits*

The graduate programs in Department of Physics offer opportunities to take part in high-level research in collaboration with international clusters including CERN, ICRANet, INFN, Max Plank, ICTP, and MiNDSTEp.

Outreach



- The Society of Physics Students at the Isfahan University of Technology
- The Society of Astronomy at the Isfahan University of Technology
- Tabesh Magazine
- The Society of Physics Students and the Society of Astronomy are professional separate associations whose main members are officially elected annually by the students of the department.



Among the basic activities of these associations are:

- Arrangement of scientific visits, scientific meetings and invited talks, scientific research unions.
- Preparation of scientific news and reports.
- Arrangement of scientific competitions and student national physics Olympiads,
- Arrangement of physics (introduction) day, and etc.





Reasons to study at this department



- The graduate courses are held with about 10 students, thus providing interactive environment in the lectures. Well-equipped experimental facilities.
- Active collaboration with international research centers and universities in Europe, Canada, and China.
- Strong links with international organizations.
- Isfahan University of Technology is a member of CERN through two faculty members in the Department of Physics. Some other faculty members collaborate on QMiCS in Quantum Flagship through European institutes, ICRANet center in Iran, INFN in Italy, and MiNDSTEP.
- Distance studies (e-learning) BSc, MSc, and Ph.D.
- Multidisciplinary educational network.
- The department of physics works closely with other departments such as Electrical and Computer Engineering, Agricultural Engineering, and Materials Engineering.
- Strong digital technologies.
- The computational condensed-matter physics research group benefits an advanced high-performance computing system.
- Stimulating environment for basic and applied research.
- Participation in European and Asian research projects.
- The complex systems and high-energy research groups participate in the European program Horizon 2020 through its faculty members.

Program Structures

BSc:

Undergraduate students must take 135 Credits as follows:

- 20 credits from General Courses
- 22 credits from Basic Courses (General Mathematics, General Physics and Chemistry).
- 59 credits from Fundamental Courses (Mathematical Physics, Classical Mechanics, Electromagnetism, Modern Physics, Quantum Mechanics, Thermodynamics, Statistical Mechanics and Computer Science)
- 22 credits from Specialized Courses (Solid State Physics, Nuclear Physics, Particle Physics, Nanophysics, Biophysics, Quantum Optics, Electronics, Computing Applications in Physics).
- 12 credits from Optional Courses (Special Relativity, Laser Physics, Group Theory, Particle Accelerators, Thin Films, Superconductivity, Reactor Physics and Undergraduate Project).





MSc:

Each master's program includes 28 credits as follows:

- 11 credits as compulsory courses (Electrodynamics, Advanced Quantum Mechanics, Advanced Statistical Mechanics).
- 9 credits as specialized courses (Advanced Solid State Physics, Advanced Nuclear Physics, Advanced Particle Physics).
- 2 credits for Physics Seminar.
- 6 credits for MSc Thesis (see below for more information).



PhD:

Each PhD Program normally takes four years to be accomplished. The period is composed of two major parts: the first year is education-oriented while the remainder (three years) of the program focuses on research.

In the first year, students are expected to collect 15 credits from the provided courses (the list includes but not limited to: Advanced Solid State Physics, Many Body Theory, Advanced Statistical Mechanics, Critical Phenomena, Advanced Condensed Matter Physics, Density Functional theory, Magnetic Properties of Materials, Advanced Nuclear Physics, Quantum Field Theory, Advanced Elementary Particle Physics, Nuclear Structure and Special Topics).

**Thesis (for BSc, MSc, PhD):**

For BSc students the thesis is optional, but strongly recommended. It is supervised by one of the faculty members and eventually examined by the internal council of referees. There shall be an oral presentation in a defense-style session. The credit is fixed at 3.

For the MSc and PhD programs, a thesis is compulsory as stated above. The MSc students are supervised by one or two faculty members, while the supervisor may decide if an advisor is also necessary. The students are supposed to defend their thesis in less than 12 months after submission of their proposal. The period, nonetheless, is extendible for another six months. The thesis is refereed by at least three referees and the students should defend their theses

through an oral presentation. Eventually, the examiners mark the research and presentations (both written and oral). (Under specific circumstances MSc Programs without a thesis are possible).

A PhD program, instead, is research-oriented; thus, the thesis takes a significant portion of the credits. At the end of the first education-oriented year, the PhD students are examined through a comprehensive examination. After its fulfillment, the PhD candidates start their research program under supervision of at least one of the faculty members in the department of physics. The PhD candidates require to prepare, defend, and pursue a three-year research plan (extendable up to another year). They should defend their thesis in a defense session with four reviewers, national and/or international.

Examinations:

The students taking courses are examined during and at the end of each semester via assignments, mid-term exams, as well as final exams. The total grade of each course is given out of 20.

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Research Areas



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- A Newton's cradle with five silver spheres hanging from black strings against a teal background. The spheres are in motion, with some blurred to indicate movement.
- Accelerator physics
 - Astroparticle Physics
 - Astrophysics and astronomy
 - Complex systems
 - Computational materials science
 - Elementary particle
 - Mathematical physics and field theory
 - Experimental condensed-matter
 - Gravitation and cosmology
 - Nuclear physics
 - Physics of nuclear radiotherapy
 - Theoretical condensed-matter
 - Theoretical quantum optics

A Profile of the Labs

The experimental condensed-matter physics research group accommodates three research labs as follows:

- Nanophysics and Nanosensors
- Magnetism and Superconductivity
- Surface Physics and Thin Film Deposition



Notable facilities:

- Closed cycle helium refrigerator
- Low temperature resistivity and magnetoresistance measurement System (20–320 K)
- High temperature resistivity measurement system (300–1000 K)
- AC magnetic susceptibility measurement system, Lakeshore, (77–325 K)
- UV/VIS spectrometer



- Vibrating sample magnetometer (VSM)
- Magneto optic lab (Kerr effect)
- High accuracy impedance analyzer (4 Hz–5 MHz)
- Magnetolectric measurement setup
- Ferroelectric loop (P-E) tester
- Epsilon vs. temperature (20–1000 K)
- Potentiostat/galvanostat (ivium)



International Profile

The Department of Physics is in collaboration with:



We would like to express our sincere thanks to the faculty members at the Department of Physics, and our colleagues at International Scientific Cooperation Center (ISCC) for sincere assistance in producing this prospectus.

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