

3. Why study theoretical physics?

Our programme prepares you for the research field of complex systems and for the application of quantum field theory, for instance in condensed matter physics, the physics of biological systems and particle physics.

For postgraduates

There are interesting career paths in the fields of quantum mechanics, high-energy physics and non-equilibrium statistical physics.

DEPARTMENT OF PHYSICS

Institute of Theoretical Physics (ITP)

Founded in 1984 with the support of the Nuclear Development Corporation of South Africa, the ITP's objectives are to undertake research projects in theoretical physics, to assist in the education of graduate students and to provide a centre for the development and co-ordination of activities in theoretical physics.

We seek to establish insights into a variety of condensed matter systems and apply them to understand the physics in certain biological systems.

Research activities include:

- Aspects of field theory
- Statistical and condensed matter physics
- Quantum phase transitions and exceptional points
- Gauge theories
- Complex systems
- Biophysics and polymer physics
- Hadronic systems and
- Cascades and multi-fractals



For more information, contact

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or visit <http://www.physics.sun.ac/theory>

General and specific admission requirements

- Average of at least 65% in the National Senior Certificate or an equivalent school leaving examination
- You have to qualify for university entrance
- Afrikaans OR English (Home Language or First Additional Language) minimum 50%
- Write the AQL and MAT National Benchmarking Tests
- Physical Sciences minimum 50%
- Mathematics 5 (Mathematics minimum 70%)



Careers in physics

- Nuclear physicist, health or radiation physicist at mines, hospitals or nuclear power stations
- Applied laser scientist
- Researcher
- Theoretical physicist
- Developer of new laser resources, techniques and analytical methods for the health and security industries
- Material developer in the environmental and medical field
- Energy researcher
- Analyst
- Academic
- Physical science teacher
(if applicable undergraduate modules are taken leading to two school subjects, such as Mathematics and Physical Sciences; and after completion of the Postgraduate Certificate in Education.)



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Physics

The Department of Physics at Stellenbosch University has a proud history, producing outstanding research and many excellent graduates since 1903.

Our graduates are well-rounded physicists with the technical and specific scientific skills required to make a unique contribution to the research and development environment.

The three research groups in the Department - the Institute for Theoretical Physics, the Laser Research Institute and the Nuclear Physics research group - have strong international collaborative ties. Numerous extraordinary professors and collaboration researchers visit the Department on a regular basis. The Department also hosts a Research Chair in Ultrafast Laser Science, as part of the National Research Foundation's South African Research Chair Initiative (SARChI chair).

This dynamic research cohort creates a vibrant and challenging environment for the development of young physicists.

We offer a BSc degree in Physics,
with a choice of one of three streams:

- 1 ➤ **NUCLEAR PHYSICS**
(Nuclear Physics, Radiation and Health Physics)
- 2 ➤ **LASER PHYSICS** (*Biological or Physical*)
- 3 ➤ **THEORETICAL PHYSICS**

➤ For postgraduates

On postgraduate level, you can specialise in one of four fields:

- **Nuclear Physics**
- **Laser Physics**
- **Radiation and Health Physics** or
- **Theoretical Physics.**



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1. Why study nuclear physics?

As a nuclear physicist you can work in environments where techniques in nuclear physics are applied. Such environments include industries and institutions like Sasol, Eskom, the South African Nuclear Energy Corporation (NECSA), the National Nuclear Regulator (NNR), the South African Bureau of Standards (SABS) and the Council for Scientific and Industrial Research.

As a radiation physicist you are able to work as a hospital physicist or as a radiation control official with organisations that monitor radiation risks, such as the Department of Health, nuclear power stations, and mines.

DEPARTMENT OF PHYSICS

Nuclear physics research group

Established in 1965, the nuclear physics research group is the oldest group in the Department of Physics.

Research fields include nuclear reaction studies and structure, covering topics such as:

- Clustering in heavy nuclei
- Production of lepton induced strange matter
- Particle correlations in ultra-relativistic heavy ion collisions
- Formation of exotic nuclear matter and
- Development of an equation of state for neutron stars based on a relativistic mean field model.

The group is closely aligned with the iThemba Laboratory for Accelerator-Based Sciences, a group of multi-disciplined research laboratories administered by the National Research Foundation which provide the facilities for basic and applied research using particle beams, particle radiotherapy for the treatment of cancer and the supply of accelerator-produced radioactive isotopes for nuclear medicine and research.



For more information, contact
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<http://www.physics.sun.ac.za/gamma5/>

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2. Why study laser physics?

Because of the rapid increase in the use of lasers in medical and biological fields, there is a worldwide need for trained physicists with expertise in optics, lasers and laser applications in the field of biology and medicine.

Lasers provide innovative solutions over a wide front benefitting humanity. In medicine, lasers are used to correct vision, heal eye disorders that may cause blindness, treat skin diseases and to do surgery. Microscopic techniques using lasers have become commonplace in medical applications. New materials and medicines that are activated by laser light are developed.

DEPARTMENT OF PHYSICS

Laser Research Institute (LRI)

The LRI was founded in 2000 as a centre for research into the scientific applications of laser and laser development in South Africa.

Our research makes use of a variety of laser spectroscopy techniques, with the main focus on method development.



Our infrastructure is well-funded and includes modern femtosecond laser systems and associated ultrafast diagnostic equipment. We are the only group in southern Africa to offer an outcomes-based University Programme in Laser Physics and we are closely aligned with national facilities such as the CSIR National Laser Centre and the African Laser Centre.



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