Master Programme in Physics 2017/2018

Would you like to gain a deeper understanding of the physical world around you? Would you like to analyse data taken with mankind’s largest instruments, for example the particle accelerator at CERN or the telescopes at the European Southern Observatory? The Master Programme in Physics provides you with the tools to understand the inner workings of the world. Be part of the exciting world of physics!

Physics at Uppsala University covers the entire length scale from subatomic strings to the whole universe, with forefront research across all subbranches of physics — from research on elementary particles and materials, the structure of the earth and its atmosphere, to space and the properties of the universe.

At the Ångström laboratory at Uppsala University, physicists collaborate on questions regarding energy, elementary particles, materials, space physics and astronomy. At the Geocentrum in Uppsala, researchers use physical principles to study and understand the earth, its weather and climate. Geocentrum is also the home for the Swedish National Seismic Network which monitors earthquakes in Sweden and worldwide. These and other existing collaborations generate a creative environment for both teaching and research.

ABOUT THE PROGRAMME

The Master Programme in Physics is developed in coordination with research groups at Uppsala University. The tutors are active researchers and the courses are linked to the frontline of physics research.

The open structure of the programme provides you with many opportunities to broaden the educational scope and to specialise in your particular area of interest.

We have an exchange agreement with South America’s best Physics Department (University of São Paulo, Brasil). This means that you can spend up to one year in São Paulo and obtain a double degree. We are also a partner university in the Nanomat network for nanophysics together with Universite Pierre et Marie Curie University in Paris, Universiteit Antwerpen in Belgium and Universita Roma III in Italy.

The programme consists of eight specialisations and one profile:

**Astronomy and Space Physics**

You study both the near-earth environment and the entire universe with the help of satellites, ground-based observations and various theoretical tools. Examples of courses are Space Physics, Physics of Planetary Systems, Cosmology, and Astronomical Instrumentation. Scientists at Uppsala University are involved in several space missions (Cassini, Gaia) and instrumentation
projects at the largest ground-based telescopes (e.g. the E-ELT).

**Energy Physics**
You will study current and future energy production through, for instance, combustion, fission and fusion. Electromagnetic Field Theory and Fluid Mechanics are basic courses that will enable you to contribute to solving mankind’s energy challenges. Energy Physics is a given jointly with the Department of Engineering Physics.

**Geophysics**
Earth’s interior is inaccessible by direct observation. Geophysics therefore uses indirect methods such as seismology, gravimetry, magnetometry, and electromagnetic measurements in order to gain information about earth’s internal composition and structure. This specialisation focuses on applied aspects (related to exploration of natural resources) and on more fundamental questions (e.g., understanding the dynamics and the origin and evolution of the earth).

**Materials Physics**
You will learn experimental and theoretical methods to study, understand and develop new materials. Examples of courses include Solid State Theory, Magnetism, Surface Physics, as well as advanced courses within atomic, molecular, and condensed-matter physics.

**Materials Theory**
Learn to perform theoretical calculations in order to understand and tailor properties of materials. We offer, for example, courses in Density Functional Theory (DFT), Many Particle Physics, Condensed Matter Theory, and Hands-on Electronic Structure Calculations. Take part in front line research and develop materials for future technologies.

**Meteorology**
Meteorology applies knowledge of physics to study the atmosphere and to understand how the weather and climate originate. You will learn about the atmosphere through a combination of theory and observation. This specialisation contains theoretical courses such as Atmospheric Physics, as well as more applied courses such as Climate Variations, and finally a Practical Meteorology course for future meteorologists or forecasters.

**Nuclear and Particle Physics**
How is matter organised on the smallest scales? How can the Standard Model be extended? Learn about the methods used to model and study the structure of matter on subatomic scales and to test the Standard Model in large-scale experiments and the theory behind it. Prominent examples with links to Uppsala include the ATLAS detector at the Large Hadron Collider (CERN – Organisation Européenne pour la Recherche Nucléaire), the neutrino telescope IceCube in Antarctica, the BES III detector at the Electron-Positron Collider BEPC II in Beijing (Kina) and the AGATA spectrometer at Grand Accélérateur National d’Ions Lourds (GANIL, Frankrike).

**Physics Didactics**
General knowledge of physics is combined with the understanding of how teaching and learning function in physics. Physics Didactics is a profile (not a separate specialisation), as you are to take courses from one or more physics tracks to study and address didactical problems.

**Theoretical Physics – Quantum Fields and Strings**
Take part in front-line research and develop the Standard Model with observed quarks and hypothetical strings. If you are interested in the mathematical foundations of physics, this specialisation is for you.

**DEGREE**
The programme leads to a Master of Science (120 credits) with Physics as the main field of study. After one year of study it may also be possible to obtain a Master of Science (60 credits).

**INSTRUCTION**
Instruction consists of lectures, teacher-supervised tuition, and guidance in conjunction with laboratory work. The forms of examination vary depending on the course content and design. Final exams are more common for theoretical courses, although many tutors have gone over to continuous examination during the course, such as group discussions and hand-in exercises. The programme takes place in Uppsala.

The teachers are active researchers and the courses closely follow current developments in physics.

The language of instruction is English.
During the programme’s first three terms, you may choose from a range of advanced physics courses, thus providing a specialisation in one field of physics. You may also choose courses from other fields (of physics) in order to create an individual profile for your Master’s degree.

The programme is concluded with a 5-month individual research degree project, in cooperation with a research group at a university, in industry or at a public authority.

The programme gives you ample opportunity to choose courses from the wide range of courses offered, both within and beyond physics Tailor your own master!

See detailed outlines for the courses within the programme specialisations:

Outline for Astronomy and Space Physics
Outline for Energy Physics
Outline for Geophysics
Outline for Nuclear and Particle Physics
Outline for Materials Physics
Outline for Materials Theory
Outline for Meteorology
Outline for Theoretical Physics: Quantum Fields and Strings

SPECIALISATIONS
- Astronomy and Space Physics
- Energy Physics
- Geophysics
- Nuclear and Particle Physics
- Materials Physics
- Materials Theory
- Meteorology
- Theoretical Physics: Quantum Fields and Strings

CAREER

With a Master’s degree in physics, you will be qualified for PhD studies in physics. Many physics Master’s students continue as PhD students, at Uppsala University or elsewhere. You will also have the opportunity to work with research and development (R&D) at various companies and public authorities.

Your mathematical competence and analytical problem-solving skills will make you an attractive recruit. Depending on the courses you take and the specialisation you choose, there are many other individual career opportunities in special areas, both within and outside the field of physics.

For example, you may find employment as a company consultant, project manager in R&D, or as a specialist in banking, insurance or research organisations.
ASTRONOMY AND SPACE PHYSICS
120 credits
Autumn 2017 100% Campus
Location: Uppsala
Application Deadline: 2016-01-15
Enrolment Code: UU-M1171
Language of Instruction: English
Requirements:
Academic requirements
A Bachelor’s degree, equivalent to a Swedish Kandidatexamen, from an internationally recognised university.
Also required is 75 credits in physics.

Language requirements
All applicants need to verify English language proficiency. This is normally attested by an internationally recognised test such as TOEFL or IELTS with the following minimum scores:
- IELTS: an overall mark of 6.5 and no section below 5.5
- TOEFL: Paper-based: Score of 4.5 (scale 1–6) in written test and a total score of 575. Internet-based: Score of 20 (scale 0–30) in written test and a total score of 90
- Cambridge: CAE, CPE

Exemptions for students from certain countries.
Selection: Students are selected based on:
- a total appraisal of quantity and quality of previous university studies; and
- a statement of purpose (1 page).

Fees: If you are not a citizen of a European Union (EU) or European Economic Area (EEA) country, or Switzerland, you are required to pay application and tuition fees. Read more about fees.

Application Fee: SEK 900
Tuition fee, first semester: SEK 72500
Tuition fee, total: SEK 290000

ENERGY PHYSICS
120 credits
Autumn 2017 100% Campus
Location: Uppsala
Application Deadline: 2016-01-15
Enrolment Code: UU-M1174
Language of Instruction: English
Requirements:
Academic requirements
A Bachelor’s degree, equivalent to a Swedish Kandidatexamen, from an internationally recognised university.
Also required is 75 credits in physics.

Language requirements
All applicants need to verify English language proficiency. This is normally attested by an internationally recognised test such as TOEFL or IELTS with the following minimum scores:
- IELTS: an overall mark of 6.5 and no section below 5.5
- TOEFL: Paper-based: Score of 4.5 (scale 1–6) in written test and a total score of 575. Internet-based: Score of 20 (scale 0–30) in written test and a total score of 90
- Cambridge: CAE, CPE

Exemptions for students from certain countries.
Selection: Students are selected based on:
- a total appraisal of quantity and quality of previous university studies; and
- a statement of purpose (1 page).

Fees: If you are not a citizen of a European Union (EU) or European Economic Area (EEA) country, or Switzerland, you are required to pay application and tuition fees. Read more about fees.

Application Fee: SEK 900
Tuition fee, first semester: SEK 72500
Tuition fee, total: SEK 290000
**GEOPHYSICS**

- **120 credits**
- **Autumn 2017 100% Campus**
- **Location:** Uppsala
- **Application Deadline:** 2016-01-15
- **Enrolment Code:** UU-M1173
- **Language of Instruction:** English
- **Requirements:**
  - **Academic requirements**
    A Bachelor’s degree, equivalent to a Swedish Kandidatexamen, from an internationally recognised university. Also required is 75 credits in physics.

**Language requirements**

All applicants need to verify English language proficiency. This is normally attested by an internationally recognised test such as TOEFL or IELTS with the following minimum scores:

- IELTS: an overall mark of 6.5 and no section below 5.5
- TOEFL: Paper-based: Score of 4.5 (scale 1–6) in written test and a total score of 575. Internet-based: Score of 20 (scale 0–30) in written test and a total score of 90
- Cambridge: CAE, CPE

**Exemptions for students from certain countries.**

**Selection:** Students are selected based on:

- a total appraisal of quantity and quality of previous university studies; and
- a statement of purpose (1 page).

**Fees:** If you are not a citizen of a European Union (EU) or European Economic Area (EEA) country, or Switzerland, you are required to pay application and tuition fees. Read more about fees.

**Application Fee:** SEK 900

**Tuition fee, first semester:** SEK 72500

**Tuition fee, total:** SEK 290000

**NUCLEAR AND PARTICLE PHYSICS**

- **120 credits**
- **Autumn 2017 100% Campus**
- **Location:** Uppsala
- **Application Deadline:** 2016-01-15
- **Enrolment Code:** UU-M1175
- **Language of Instruction:** English
- **Requirements:**
  - **Academic requirements**
    A Bachelor’s degree, equivalent to a Swedish Kandidatexamen, from an internationally recognised university. Also required is 75 credits in physics.

**Language requirements**

All applicants need to verify English language proficiency. This is normally attested by an internationally recognised test such as TOEFL or IELTS with the following minimum scores:

- IELTS: an overall mark of 6.5 and no section below 5.5
- TOEFL: Paper-based: Score of 4.5 (scale 1–6) in written test and a total score of 575. Internet-based: Score of 20 (scale 0–30) in written test and a total score of 90
- Cambridge: CAE, CPE

**Exemptions for students from certain countries.**

**Selection:** Students are selected based on:

- a total appraisal of quantity and quality of previous university studies; and
- a statement of purpose (1 page).

**Fees:** If you are not a citizen of a European Union (EU) or European Economic Area (EEA) country, or Switzerland, you are required to pay application and tuition fees. Read more about fees.

**Application Fee:** SEK 900

**Tuition fee, first semester:** SEK 72500

**Tuition fee, total:** SEK 290000
MATERIALS PHYSICS
120 credits
Autumn 2017 100% Campus
Location: Uppsala
Application Deadline: 2016-01-15
Enrolment Code: UU-M1176
Language of Instruction: English
Requirements:
Academic requirements
A Bachelor’s degree, equivalent to a Swedish Kandidatexamen, from an internationally recognised university.
Also required is 75 credits in physics.

Language requirements
All applicants need to verify English language proficiency. This is normally attested by an internationally recognised test such as TOEFL or IELTS with the following minimum scores:

- IELTS: an overall mark of 6.5 and no section below 5.5
- TOEFL: Paper-based: Score of 4.5 (scale 1–6) in written test and a total score of 575. Internet-based: Score of 20 (scale 0–30) in written test and a total score of 90
- Cambridge: CAE, CPE

Exemptions for students from certain countries.
Selection: Students are selected based on:
- a total appraisal of quantity and quality of previous university studies; and
- a statement of purpose (1 page).

Fees: If you are not a citizen of a European Union (EU) or European Economic Area (EEA) country, or Switzerland, you are required to pay application and tuition fees. Read more about fees.

Application Fee: SEK 900
Tuition fee, first semester: SEK 72500
Tuition fee, total: SEK 290000

MATERIALS THEORY
120 credits
Autumn 2017 100% Campus
Location: Uppsala
Application Deadline: 2016-01-15
Enrolment Code: UU-M1177
Language of Instruction: English
Requirements:
Academic requirements
A Bachelor’s degree, equivalent to a Swedish Kandidatexamen, from an internationally recognised university.
Also required is 75 credits in physics.

Language requirements
All applicants need to verify English language proficiency. This is normally attested by an internationally recognised test such as TOEFL or IELTS with the following minimum scores:

- IELTS: an overall mark of 6.5 and no section below 5.5
- TOEFL: Paper-based: Score of 4.5 (scale 1–6) in written test and a total score of 575. Internet-based: Score of 20 (scale 0–30) in written test and a total score of 90
- Cambridge: CAE, CPE

Exemptions for students from certain countries.
Selection: Students are selected based on:
- a total appraisal of quantity and quality of previous university studies; and
- a statement of purpose (1 page).

Fees: If you are not a citizen of a European Union (EU) or European Economic Area (EEA) country, or Switzerland, you are required to pay application and tuition fees. Read more about fees.

Application Fee: SEK 900
Tuition fee, first semester: SEK 72500
Tuition fee, total: SEK 290000
METEOROLOGY
120 credits
Autumn 2017 100% Campus
Location: Uppsala
Application Deadline: 2016-01-15
Enrolment Code: UU-M1172
Language of Instruction: English
Requirements:
Academic requirements
A Bachelor's degree, equivalent to a Swedish Kandidatexamen, from an internationally recognised university.
Also required is 75 credits in physics.

Language requirements
All applicants need to verify English language proficiency. This is normally attested by an internationally recognised test such as TOEFL or IELTS with the following minimum scores:
- IELTS: an overall mark of 6.5 and no section below 5.5
- TOEFL: Paper-based: Score of 4.5 (scale 1–6) in written test and a total score of 575. Internet-based: Score of 20 (scale 0–30) in written test and a total score of 90
- Cambridge: CAE, CPE

Exemptions for students from certain countries.
Selection: Students are selected based on:
- a total appraisal of quantity and quality of previous university studies; and
- a statement of purpose (1 page).

Fees: If you are not a citizen of a European Union (EU) or European Economic Area (EEA) country, or Switzerland, you are required to pay application and tuition fees. Read more about fees.
Application Fee: SEK 900
Tuition fee, first semester: SEK 72500
Tuition fee, total: SEK 290000

THEORETICAL PHYSICS: QUANTUM FIELDS AND STRINGS
120 credits
Autumn 2017 100% Campus
Location: Uppsala
Application Deadline: 2016-01-15
Enrolment Code: UU-M1178
Language of Instruction: English
Requirements:
Academic requirements
A Bachelor's degree, equivalent to a Swedish Kandidatexamen, from an internationally recognised university.
Also required is 75 credits in physics.

Language requirements
All applicants need to verify English language proficiency. This is normally attested by an internationally recognised test such as TOEFL or IELTS with the following minimum scores:
- IELTS: an overall mark of 6.5 and no section below 5.5
- TOEFL: Paper-based: Score of 4.5 (scale 1–6) in written test and a total score of 575. Internet-based: Score of 20 (scale 0–30) in written test and a total score of 90
- Cambridge: CAE, CPE

Exemptions for students from certain countries.
Selection: Students are selected based on:
- a total appraisal of quantity and quality of previous university studies; and
- a statement of purpose (1 page).

Fees: If you are not a citizen of a European Union (EU) or European Economic Area (EEA) country, or Switzerland, you are required to pay application and tuition fees. Read more about fees.
Application Fee: SEK 900
Tuition fee, first semester: SEK 72500
Tuition fee, total: SEK 290000

CONTACT & MORE INFO

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