PHYSICS
Study Programmes
“Science is a way of life. Science is a perspective. Science is the process that takes us from confusion to understanding...”

Brian Greene

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The Faculty of Science, Technology and Communication (FSTC) at a glance

- 1 faculty
- 5 research units
- 3 campus sites
- 1,900 Bachelor & Master students
- 100 different countries
- 60% international students
- more than 470 staff members
- 30 study programmes
- more than 500 doctoral candidates
- 3 official languages

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Why study

Physics?

Luxembourg needs physicists!

PHYSICS IS EVERYWHERE

Physics helps you to better understand how the universe and the world around you work. Physics leads to breakthrough technologies like smartphones and to great discoveries such as black holes. Studying physics enables you to develop analytical and problem-solving skills. These skills are highly demanded in scientific research and in other popular sectors such as finance and banking, consultancy and industry. Moreover, in Luxembourg, physics graduates have excellent opportunities to become science teachers in an unusually well-resourced education system.

COMPLETE TRAINING OFFER

The Physics and Materials Science Research Unit (PHYMS) at the University of Luxembourg offers study programmes in physics at all levels. You can pursue a bachelor, a master, or a doctoral degree with many possible specialisations. The uniqueness of our bachelor and master programmes is that students are able to focus on research. In particular, the sixth semester of the bachelor programme and the second year of the master programme are entirely dedicated to your thesis, which allows you to engage in-depth with modern research. Besides, no tuition fees are charged for studying physics at the University of Luxembourg.

MANY OPPORTUNITIES

According to a recent internal survey, our physics graduates are currently working at schools, universities, research institutes, banks and companies in Luxembourg and around the world.

Excellent physics training: join our university!

Studying physics at the University of Luxembourg offers many advantages.

INDIVIDUAL MENTORING/COACHING

As a bachelor or master student here, you attend inspiring lectures in small classes and perform captivating experiments in small groups. An excellent professor-to-student ratio in physics allows you to have close contact with our internationally renowned professors.

OPPORTUNITIES TO CONDUCT RESEARCH IN INDUSTRY

Thanks to strong links with industry, you have great opportunities to get involved in projects directly sponsored by companies. Recent participating companies include EIE, Ceratizit, Goodyear and Husky in Luxembourg and some international companies such as Avancis, Bosch, Fisom, IBM, IMRA, Manz, TDK, Toyota and Umicore.

DISTINGUISHED JOINT-DEGREE PROGRAMMES

If you speak English and German or French, you can choose to participate in a joint-degree programme with our partner universities in Germany (Saarland University) or France (Université de Lorraine or Université Grenoble Alpes). You will be awarded a joint bachelor or master degree certificate from the involved universities. Even if you are not enrolled in a joint-degree bachelor programme, you can go for a mobility semester, spending half of an academic year almost anywhere in the world.

OUTSTANDING STUDY AND RESEARCH ENVIRONMENT

During your studies, you are surrounded by professors, researchers, and students from many different countries, who are willing to discuss your new ideas. For your research activities, we provide you with world-class facilities. Furthermore, our research groups are carrying out world-leading research in a wide range of fields (see page 17). You will enjoy a pleasant and multicultural study experience here!
Our Study Programmes

Overview

**BACHELOR** (3 years)

Bachelor in Science and Engineering  - Physics track (BASI-PHY)

180 ECTS

**MASTER** (2 years)

Master of Science in Physics (MPHY)

120 ECTS

**DOCTORAL EDUCATION**

Doctoral Programme in Physics and Materials Science (DPPM)
This Bachelor programme allows students to gain knowledge about the main areas of physics. It familiarises them with the necessary mathematical tools and allows for specialisation via a wide range of elective courses.

**STRENGTHS**
- Combination of lectures and current research
- Broad range of elective courses (computer science, didactics, astronomy, geophysics...)
- Studies abroad in semester 3, 4, or 5 are possible

**ADMISSION REQUIREMENTS**
- Luxembourgish secondary school diploma or
- Foreign diploma recognised as equivalent by the Luxembourg Ministry of Education

**CAREER OPPORTUNITIES**
- Master in Physics or other natural sciences

**PROGRAMME AT A GLANCE**
- **Duration:** 3 year full-time programme/6 semesters (180 ECTS), including 1 mobility semester in a foreign country
- **Languages:** English (75%) & French (25%)
- **Registration fees:** 400€/semester (1 & 2) 200€/semester (3 to 6)
- **Application period:**
  - For EU students: April - August
  - For non-EU students: January - April

**ADDITIONAL INFORMATION**
- **CONTACT**
  basi.phy@uni.lu
- **CAMPUS**
  Limpertsberg and Belval
  basi-phy.uni.lu

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“The programme is highly diversified, giving a solid foundation in experimental and theoretical physics. Since physics is an interesting but challenging field of study, the great advantage here is the limited number of students in a course, which makes it possible for students to ask whatever question at any time and discuss it with the professor until everything is clear. Since the university is rather small, even the bachelor students can talk with members of the different research groups and get a glimpse at current research projects.”

Lena Merges, bachelor student

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**PROGRAMME**

<table>
<thead>
<tr>
<th>Courses</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Semester 1</strong></td>
<td></td>
</tr>
<tr>
<td>Algebra</td>
<td>5</td>
</tr>
<tr>
<td>Analysis</td>
<td>5</td>
</tr>
<tr>
<td>Experimental physics: mechanics, waves, thermodynamics</td>
<td>8</td>
</tr>
<tr>
<td>Lab course</td>
<td>4</td>
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<tr>
<td>Mathematical methods</td>
<td>6</td>
</tr>
<tr>
<td>Elective courses</td>
<td>2</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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<tr>
<td><strong>Semester 2</strong></td>
<td></td>
</tr>
<tr>
<td>Algebra</td>
<td>6</td>
</tr>
<tr>
<td>Analysis</td>
<td>6</td>
</tr>
<tr>
<td>Experimental physics: electrodynamics and optics</td>
<td>8</td>
</tr>
<tr>
<td>Mathematical methods</td>
<td>4</td>
</tr>
<tr>
<td>Theoretical physics: mechanics</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
<tr>
<td><strong>Semester 3</strong></td>
<td></td>
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<tr>
<td>Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>Experimental physics: modern physics</td>
<td>6</td>
</tr>
<tr>
<td>Lab course</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics</td>
<td>6</td>
</tr>
<tr>
<td>Mathematical methods</td>
<td>4</td>
</tr>
<tr>
<td>Theoretical physics: electrodynamics and relativity</td>
<td>6</td>
</tr>
<tr>
<td>Elective courses</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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<tr>
<td><strong>Semester 4</strong></td>
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<tr>
<td>Chemistry</td>
<td>2</td>
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<tr>
<td>Elective courses</td>
<td>4</td>
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<tr>
<td>Lab course</td>
<td>8</td>
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<tr>
<td>Mathematics</td>
<td>6</td>
</tr>
<tr>
<td>Programming</td>
<td>4</td>
</tr>
<tr>
<td>Theoretical physics: quantum mechanics</td>
<td>6</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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<tr>
<td><strong>Semester 5</strong></td>
<td></td>
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<tr>
<td>Condensed matter physics</td>
<td>6</td>
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<tr>
<td>Continuum mechanics</td>
<td>4</td>
</tr>
<tr>
<td>Literature seminar</td>
<td>5</td>
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<tr>
<td>Particle physics</td>
<td>4</td>
</tr>
<tr>
<td>Theoretical physics: statistical physics</td>
<td>8</td>
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<tr>
<td>Elective courses</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<tr>
<td><strong>Semester 6</strong></td>
<td></td>
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<tr>
<td>Bachelor thesis</td>
<td>27</td>
</tr>
<tr>
<td>Bachelor seminar</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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</tbody>
</table>
This Master enables students to acquire a solid and broad education in condensed-matter and materials physics. The goal is to explain and predict the physical properties of materials, e.g., semiconductors, magnetic materials and liquid crystals, based on their microscopic constituents. While the first year of this Master consists of lectures, exercises and laboratory classes, the complete second year is devoted to conducting research in one of our experimental/theoretical groups.

**STRENGTHS**
- Individual coaching and courses taught in small groups
- Internationally renowned professors
- Full scope from soft matter to solid-state physics
- Collaboration with industry
- Involvement in current research activities (two semesters of research)
- Strong links with the Luxembourg Institute of Science and Technology (LIST)
- Possibility to spend the second year either in Germany or France (bi-national master)

**ADMISSION REQUIREMENTS**
- Bachelor degree in physics or related field

**CAREER OPPORTUNITIES**
- PhD in physics
- Positions in all industrial sectors (electronics, automotive, aerospace, banking, biomedical, etc.)

**PROGRAMME AT A GLANCE**
- **Duration:** 2 year full-time programme/4 semesters (120 ECTS)
- **Language:** English
- **Registration fees:** 200€/semester
- **Application period:**
  - For EU students: January - July
  - For non-EU students: January - April

**ADDITIONAL INFORMATION**

**CONTACT**
mphy@uni.lu

**CAMPUS**
Limpertsberg and Belval

mphy.uni.lu

**STUDY PROGRAMMES PHYSICS**

“... The Master gives me a chance to deepen my knowledge in condensed matter and materials physics. I chose to apply for this Master programme because I like its attractive curriculum and system of study. To me, the study environment here is inspiring, creative, and friendly. I appreciate, in particular, the wide range of research topics and the freedom to participate in any of research projects. I also really enjoy being exposed to the cultures, history, and languages in Luxembourg. In summary, this Master has met all my initial expectations, strongly enriched my perspectives, and will surely help me in my future career.”

Sergi Batlle Porro, master student
Doctoral Programme in Physics and Materials Science (DPPM)

This programme offers a research based doctorate at an internationally leading level. The aim of the research is to understand the fundamentals and applications of materials physics and materials science. The training is based on personal supervision and on specialised and transferable skills courses.

In collaboration with:

STRENGTHS

- Close and personal supervision by internationally leading scientists
- Immediate integration into research groups and projects
- Work contract at the University or at LIST, competitive salary
- Benefits from the integration into the Doctoral School in Science and Engineering (DSSE)
- Broad offer of disciplinary, interdisciplinary and transferable skills training
- State of the art laboratories and computer equipment

ADMISSION REQUIREMENTS

- Master’s degree in Physics, Chemistry, Materials Science or equivalent

CAREER OPPORTUNITIES

- Post doctoral research all over the world
- Positions in industry in Luxembourg or else in Europe
- Positions in public administration

PROGRAMME AT A GLANCE

- Duration: 36 to 48 months (20 ECTS)
- Registration fees: 200€/semester
- Language: English
- Current number of doctoral candidates: 91

ADDITIONAL INFORMATION

CONTACT
dppm@uni.lu

CAMPUS
Limpertsberg and Belval

dppm.uni.lu

"The doctoral school was very helpful in guiding me towards improving both my technical and personal skills. I managed to enrich my technical skills by attending different conferences, workshops and courses. In addition, my participation in different leadership, language and management skills’ courses paved the way to strengthen my personal skills. The doctoral school played an important role in developing my future career path. The results of that can be observed at the end of my doctorate where I succeeded to start working in industry in Germany immediately after finishing my thesis. The doctoral school is a challenge full of opportunities."

Hossam Elanzeery, alumni
Physics and Materials Science Research Unit (PHYMS)

The Department of Physics and Materials Science has an excellent international reputation for its research in condensed-matter physics and related areas. Experimental, theoretical, and computational research groups explore the fascinating properties of a large variety of solid, soft and liquid materials and develop materials with novel functionalities. We use the laws of quantum mechanics to understand the atomic structure and the complex physical behaviour of materials. Based on this knowledge, we explore the application of materials in cutting-edge technology, e.g., for sensing, solar energy, information processing, and cryptography. The department has also established strong connections within the university, such as the "physics meets biology" initiative which helps to understand complex biological phenomena with modern physical methods, and externally with other national research partners, such as the Luxembourg Institute of Science and Technology (LIST). Naturally, the staff of the department maintains multiple international collaborations around the world.

Research areas

- **SOFT & LIVING MATTER**
  - Physics of Advanced Materials: polymers and nanocomposites
  - Experimental Soft Matter Physics: liquid crystals, colloids, and polymers
  - Crystals and Nanomaterials
  - Physics of Living Matter: biophysics, materials, microbiome, ecology, bio-engineering, modeling

- **ENERGY MATERIALS & SEMICONDUCTORS**
  - Photovoltaics: semiconductor physics, single and tandem solar cells
  - Energy Materials: small solar cells and novel semiconductor materials
  - Scanning Probe Microscopy: perovskites, surfaces and interfaces of solar materials

- **SPECTROSCOPY OF COMPLEX MATERIALS**
  - NanoMagnetsism: magnetic small-angle neutron scattering
  - Multifunctional Ferroic Materials: functional materials
  - Ultra-Fast Spectroscopy: innovative ultrafast systems

- **THEORY & MATERIALS MODELLING**
  - Complex Systems and Statistical Mechanics: stochastic and quantum thermodynamics
  - Theoretical solid state physics: semiconducting and nanostructured materials
  - Theory of Mesoscopic systems: quantum mechanical effects
  - Theoretical Chemical Physics: complex molecules and materials

**PHYMS at a glance**

- **MEMBERS**
  - 14 professors and 4 research scientists
  - 45 post-docs and 45 doctoral candidates
  - 36 technical and administrative staff

- **FUNDING AND COLLABORATIONS**
  - 50% third-party funding – €3.5 million of grants in 2018
  - 4 ERC grant holders & 6 FNR ATTRACT fellows since 2010

- **PUBLICATIONS (2018)**
  - 86 peer-reviewed articles in scientific journals, including Science and Nature journals

**ADDITIONAL INFORMATION**

**CONTACT**

phyms@uni.lu

**CAMPUS**

Limpertsberg and Belval

phyms.uni.lu
The University of Luxembourg is a European research-oriented university with a strong international and multilingual character. Founded in 2003, the university currently counts more than 6,000 students. Members of the university community come from all over the world.


Join us on Facebook:
www.facebook.com/uni.lu

Young, dynamic and international

Three campus sites

Belval Campus
2 avenue de l’Université
L-4365 Esch-sur-Alzette

Kirchberg Campus
6 rue Richard Coudenhove-Kalergi
L-1359 Luxembourg

Limpertsberg Campus
162 A avenue de la Faïencerie
L-1511 Luxembourg
Located in the heart of Europe, the Grand Duchy of Luxembourg boasts a colourful history, stunning landscape, multicultural environment and multilingual population. The thousand year old capital and five regions each have their own unique flavour and discoveries to be made. Experience contemporary and historic culture, explore the country’s hiking and cycling trails, and taste world-class cuisine and local wine.

Visitluxembourg.com