



PHYSICS

**"SCIENCE IS NOT ONLY A DISCIPLE OF REASON BUT,
ALSO, ONE OF ROMANCE AND PASSION."**

STEPHEN HAWKING



UNIVERSITÉ DU
LUXEMBOURG



Brian
Greene

WE DEVELOP **TALENTS**

FSTM has a key mission: attract and train the talents that Luxembourg and the world will need in the STEM fields (Science, Technology, Engineering and Mathematics) as well as in Medicine.



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The Faculty of Science, Technology and Medicine (FSTM) at a glance

The Faculty of Science, Technology and Medicine (FSTM) contributes multidisciplinary expertise in the fields of Mathematics, Physics, Engineering, Computer Science, Life Sciences and Medicine. Through its dual mission of teaching and research, the FSTM seeks to generate and disseminate knowledge and train new generations of responsible citizens, in order to better understand, explain and advance society and environment we live in.



1
Faculty

5

Departments

3

Campus sites



5

Disciplines

41

Study programmes

3

Official languages



2,000
Students

130
Countries

56%
International students

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 Department of Physics and Materials Science (DPhyMS) 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 IEE, Ceratizit, Goodyear and Husky in Luxembourg and some international companies such as Avancis, Bosch, Flisom, 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 participating 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.

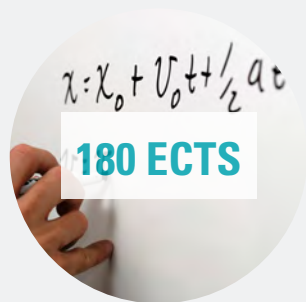
OUTSTANDING STUDY AND RESEARCH ENVIRONMENT

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!



Overview

BACHELORS (3 years)



Bachelor in Physics



Bachelor Saar-Lor-lux in Physics



MASTERS (2 years)



Master of Science in Physics



Master Saar-Lor-Lux- Gre in Physics

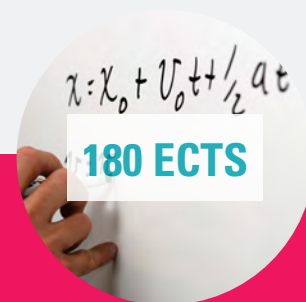
DOCTORAL EDUCATION



Doctoral Programme in Physics and Materials Science



Bachelor in Physics



PROGRAMME

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
- Languages: B2 in English and B1 in French

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: February - August
 - For non-EU students: February - April

ADDITIONAL INFORMATION

CONTACT

bphy@uni.lu

CAMPUS

Limpertsberg

bphy.uni.lu



Courses	ECTS
Semester 1	
Analysis for applications	5
Experimental physics: mechanics, oscillations and waves	5
Experimental physics: thermodynamics	3
Linear algebra	5
Mathematical methods	6
TP Physique	4
Options	
Introduction à l'astronomie et à la géodésie	2
Programming for physics	4
Total required	30

Semester 2	
Analyse et applications	6
Experimental physics: electromagnetism	5
Experimental physics: optics	3
Linear algebra	4
Mathematical methods	2
Theoretical physics: mechanics	6
Options	
Introduction to geophysics: learning to think like a scientist	2
Logiciels mathématiques	3
Total required	30

Semester 3	
Chemistry	2
Experimental physics: modern physics	6
Mathematical methods	4
TP Physique	4
Theoretical physics: electrodynamics and relativity	6
Options	
Analyse	12
Französisch	2
Introduction à l'astronomie et à la géophysique	2
Physics didactics	3
Probabilités et statistiques	5
Programming for physics	4
Techniques de présentation français-allemand	2

Semester 4	
Chemistry	2
Advanced lab course	8
Programming	3
Theoretical physics: quantum mechanics	6
Options	
Analyse	2
Analyse numérique pour ingénieurs et physiciens	4
Data science and machine learning in physics	3
Didactics for physics	3
Introduction to geophysics: learning to think like a scientist	2
Logiciels mathématiques	3
Probabilités et statistiques	3
Schreibwerkstatt bilingual - Atelier d'écriture bilingue F/D	2
Total required	30

Semester 5	
Condensed matter physics	6
Continuum mechanics	4
Literature seminar	5
Particle physics	4
Theoretical physics: statistical physics	8
Options	
Défis mathématiques par approches élémentaires	3
Introduction à l'astronomie et à la géodésie	2
Physics didactics	3
Total required	30

Semester 6	
Bachelor thesis	27
Bachelor seminar	3
Total	30



"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, graduate



Bachelor Saar-Lor-Lux in Physics

180 ECTS

This Bachelor is jointly offered by the universities of Luxembourg, Lorraine and Saarland. It provides a solid knowledge in experimental and theoretical physics in a multicultural and multilingual context.

STRENGTHS

- Bachelor diploma from all three universities (1st year in Nancy, 2nd year in Luxembourg and 3rd year in Saarbrücken)
- Financial support from the Franco-German University (DFH/UFA): 300€/month
- Language courses are part of the programme

ADMISSION REQUIREMENTS

- Luxembourgish secondary school diploma or foreign diploma recognised as equivalent by the Luxembourg Ministry of Education
- Languages: B2 in French and German. Skills will be assessed in a personal phone interview

CAREER OPPORTUNITIES

- Master Saar-Lor-Lux-Gre in Physics
- Master in Physics or other natural sciences

In collaboration with:



PROGRAMME AT A GLANCE

- **Duration:** 3 year full-time programme/ 6 semesters (180 ECTS)
- **Languages:** French (40%), English (30%), German (30%)
- **Registration fees:** *to be paid every year at the respective university*
- Luxembourg: 400€
- **Application period:** *An information and enrollment day is organised in July in Nancy*
→ For EU students: February - August
→ For non-EU students: February - April

ADDITIONAL INFORMATION

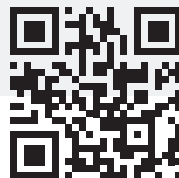
CONTACT

bphy@uni.lu

CAMPUS

Nancy, Luxembourg and Saarbrücken

bphy.uni.lu



PROGRAMME

Courses	ECTS
Semester 1 - Université de Lorraine (campus Nancy)	
Chimie	6
German/French	3
Mathématiques	6
Physique	9
Physique théorique	6
Total	30

Semester 2 - Université de Lorraine (campus Nancy)	
Calcul scientifique	3
Chimie	4
Electromagnétisme	6
German/French	3
Mathématiques	6
Physique	8
Total	30

Semester 3 - Université du Luxembourg (campus Limpertsberg)	
Lab course	4
Mathematical methods	3
Mathematics	6
Modern physics	6
Probability and statistics	3
Theoretical physics: electrodynamics and relativity	6
Elective courses	2
Total required	30

Semester 4 - Université du Luxembourg (campus Limpertsberg)	
Lab course	8
Mathematics	6
Probability and statistics	2
Programming	4
Theoretical physics: quantum mechanics	6
Elective courses	4
Total required	30

Semester 5 - Universität des Saarlandes (campus Saarbrücken)	
Festkörperphysik	4
Lab course	9
Quantenphysik und Statistische Physik	8
Internship	5
Elective courses	6
Total required	32

Semester 6 - Universität des Saarlandes (campus Saarbrücken)	
Kern- und Elementarteilchenphysik	4
Bachelor thesis	12
Seminar	6
Elective courses	6
Total required	28



120 ECTS

Master of Science in Physics

This Master enables students to acquire a solid and broad education in physics with emphasis on the research areas explored at the university of Luxembourg: quantum science and technology, photovoltaics, spectroscopy and functional materials, soft and living matter, statistical physics and machine learning. The first year consists of lectures and laboratory work while the second year is entirely devoted to a research project carried out in one of our research group, at the Luxembourg Institute of Science and Technology (LIST), or in a partner company.

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)

ADMISSION REQUIREMENTS

- Bachelor degree in physics or related field
- Language: B2 in English

CAREER OPPORTUNITIES

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



"The Master gives me a chance to deepen my knowledge in condensed matter and materials physics. I chose to apply for this 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, graduate

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: February - July
→ For non-EU students: February - April

ADDITIONAL INFORMATION

CONTACT

mphy@uni.lu

CAMPUS

Belval and Limpertsberg

mphy.uni.lu



PROGRAMME

Courses	ECTS
Semester 1	
Advanced experimental and theoretical laboratory classes	3
Advanced materials characterization techniques	2
Classical and quantum information theory	4
Classical and quantum transport	4
Computational methods	4
Colloids and liquid crystals	4
Laser physics	4
Solid state physics	6
Elective courses	
111 Lernen und schulisches Lernen	4
Academic English	3
Discrete-time stochastic processes	6
Physics didactics	3
Total required	33

Semester 2	
Advanced experimental and theoretical laboratory classes	3
Ferroelectrics and multiferroics	4
Introduction to general relativity	4
Literature seminar	2
Nonequilibrium soft and active matter	4
Physics of living matter	4
Semiconductor and solar cells	4
Elective courses	
Advanced engineering materials	4
Communicating science	3
Didactics for physics	3
Knowledge discovery and data mining	5
Partial differential equations	8
Principles of software development	5
Total required	27

Semester 3	
Research project	30
Total	30

Semester 4	
Research project	30
Total	30





Master Saar-Lor-Lux-Gre in Physics



This Master is developed in partnership with the Universities of Luxembourg, Lorraine, Saarland and Grenoble Alpes. It enables students to acquire a solid and broad education in physics in a multicultural and multilingual context. Students do their 1st year of the Master in one of the 4 universities and the 2nd year abroad at one of the other partner universities.

STRENGTHS

- Double diploma from University of Luxembourg and Lorraine, Saarland or Grenoble Alpes
- Focus on condensed matter physics and materials physics at the University of Luxembourg
- Language courses are part of the programme
- Multicultural and multilingual aspects

ADMISSION REQUIREMENTS

- Bachelor degree in physics or related field
- Languages: B2 in English/French or English/German

CAREER OPPORTUNITIES

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



“Living and learning in a highly international environment allows the students to build up cultural competence and opens many opportunities in our border region. The programme gives us the possibility to choose a curriculum and university, which fit most with our respective interests. Moreover, highly motivated teaching staff and state of the art labs provide a motivating learning experience up to the current state of research in various fields.”

Tobias Fischbach, graduate

In collaboration with:



PROGRAMME AT A GLANCE

- **Duration:** 2 year full-time programme/ 4 semesters (120 ECTS)
- **Language:** English/French or English/German
- **Registration fees:** *to be paid every year at the respective university*
- Luxembourg: 400€
- **Application period:**
→ For EU students: February - July
→ For non-EU students: February - April

ADDITIONAL INFORMATION

CONTACT

mphy@uni.lu

CAMPUS

Luxembourg, Nancy,
Saarbrücken or Grenoble



mphy.uni.lu



PROGRAMME

Université de Lorraine

Year 1

Initiation à la recherche
Outils numériques et modélisation
Physique atomique et moléculaire
Physique de la matière condensée
Physique des plasmas
Physique expérimentale
Physique quantique
Physique statistique
Physique théorique
Projets tutorés
Recherche bibliographique
Théorie des champs

Year 2

Specialisation: Matière condensée et Nanophysique
Grands instruments
Interaction rayonnement-matière
Magnétisme et nanomagnétisme
Méthodes numériques en matière condensée
Physique du solide avancé
Relation structure-propriétés des matériaux
Séminaire communication scientifique
Semi-conducteurs et composants quantiques
Surfaces, interfaces et nano-objets
Techniques expérimentales en nanosciences
Specialisation: Sciences de la fusion et des plasmas
Chauffage
Diagnostic
Fusion par confinement magnétique
Interactions plasma/paroi
Magnéto-hydrodynamique
Modélisation et méthodes numériques
Physique et technologie des plasmas
Physique et technologie des plasmas de décharge
Physique et technologie des plasmas de fusion magnétique
Travaux pratiques
Turbulence et transport

Universität des Saarlandes

Year 1

Allgemeine Relativitätstheorie
Computational Molecular Biophysics
Computerphysik
Einführung in die experimentelle Methoden der Bio- und Oberflächenphysik
Einführung in die konforme Invarianz
Einführung in die Kosmologie
Einführung in die Quanteninformationsverarbeitung
Elektronenmikroskopie
Experimental quantum optics and quantum communication
Experimentelle und statistische Biologische Physik

Image Processing and Computer Vision
Kapillarität und Benetzungsphänomene
Materie in elektromagnetischen Feldern
Moderne Optik
Nanobiomaterialien
Nanomechanik
Nanostrukturphysik
Nichtlineare Dynamik und Strukturbildung
Partielle Differentialgleichungen
Quantentheorie des Lichts
Quantum Optics with Ultracold Atoms
Rheologie und Strömungsdynamik komplexer Flüssigkeiten
Stochastic Processes
Technische und Moderne Optik
Teilchenfallen und Laserkühlung
Theoretische Biophysik
Theoretische Physik für Quantentechnologien
Programmierung

Year 2

Seminar
Laborprojekt
Master-Arbeit

Université de Grenoble Alpes

Year 1

Advanced data analysis
Dynamic systems, chaos and applications
English
Fields and fluids
General relativity and cosmology
Imaging and microscopy
Magnetism and nanosciences
Matter radiation interaction
Nanophysics with local probes
Nuclear physics and particles
Occupational integration
Optical: imaging and microscopy
Optics: lasers and spectroscopy
Quantum mechanics and atomic physics
Quantum relativistic mechanics
Semiconductors
Solid state physics, magnetism and semiconductors
Statistical physics
Structure and stellar evolution
Waves and dynamics of the earth

Year 2

Complex fluids
Fundamentals of structural biology
Large scale facilities
Nano-pores and membranes technologies
Numerical methods
Out-of-equilibrium statistical physics
Physics of biological systems
Research project and professional integration
Soft matter
Internship



Doctoral Programme in Physics and Materials Science



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

In collaboration with:

LUXEMBOURG
INSTITUTE OF SCIENCE
AND TECHNOLOGY



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
- Positions in industry in Luxembourg or in Europe
- Positions in public administration

PROGRAMME AT A GLANCE

- **Duration:** 36 to 48 months
- **Language:** English
- **Disciplinary and transferable skills courses** (20 ECTS)
- **Registration fees:** 200€/semester
- **Number of doctoral candidates:** 113

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 the German industry immediately after finishing my thesis. The doctoral school is a challenge full of opportunities."

Hossam Elanzeery, graduate



Department of Physics and Materials Science

The Department of Physics and Materials Science (DPhyMS) has an excellent international reputation for its research on a wide range of fundamental and applied topics. The joint efforts of experimental and theoretical physicists have resulted in multiple breakthroughs published in top-level international journals and numerous prestigious EU, ERC and FNR grants. Members of DPhyMS are involved in multipronged collaborations at national and international levels and with industry (Goodyear, IEE, Janssen, Google). For instance, DPhyMS has already launched joint projects in the fields of biophysics and complex living systems with LCSB to understand complex biological phenomena with modern physical methods. DPhyMS has also a long-standing collaboration with the Materials Research and Technology department of LIST, which aims to establish a strong pole for materials research in Luxembourg. DPhyMS will also continue to foster interdisciplinary research collaborations with other Departments and Faculties, as well as with industry, on topics related to machine learning, artificial intelligence and big data analytics.



DPhyMS at a glance

MEMBERS

- 21 professors
- 14 research scientists
- 120 post-docs and doctoral candidates
- 15 technical and administrative staff

FUNDING AND COLLABORATIONS

- €30 million acquired in new research projects in 2020-2022
- 8 FNR ATTRACT fellows since 2010
- 4 ERC grant holders, including one Advanced
- 3 ERC proof-of-concept grants and Luxembourg's first EIC grant

PUBLICATIONS (2022)

- 150 peer-reviewed articles in scientific journals

ADDITIONAL INFORMATION

CONTACT

dphyms@uni.lu

CAMPUS

Limpertsberg and Belval

dphyms.uni.lu



Research areas

The department (DPhyMS) carries out research activities around five thematic axes:

PHOTOVOLTAICS & SUSTAINABLE ENERGY

We investigate the physics of materials and quantum mechanical systems that are used in the conversion of renewable energy sources like sun and wind. The research stretches from the fundamental understanding to the development of devices. We are proud to combine exciting questions in fundamental physics with societal impact.

QUANTUM SCIENCE & TECHNOLOGY

This cluster is composed of theory groups and experimental groups that jointly span a range of topics in quantum information science, many-body physics, statistical mechanics and machine learning, quantum chemistry, and light-matter interactions for the advancement of emergent quantum technologies.

SOFT & LIVING MATTER

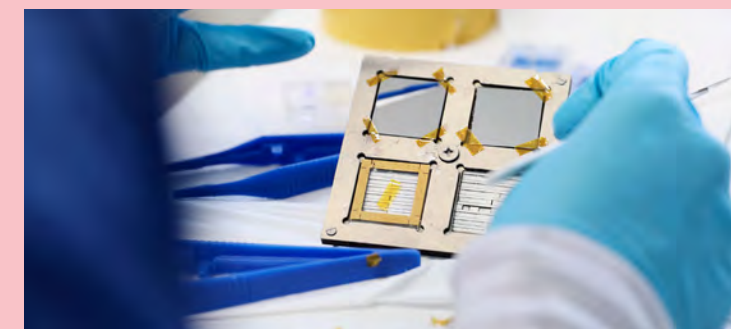
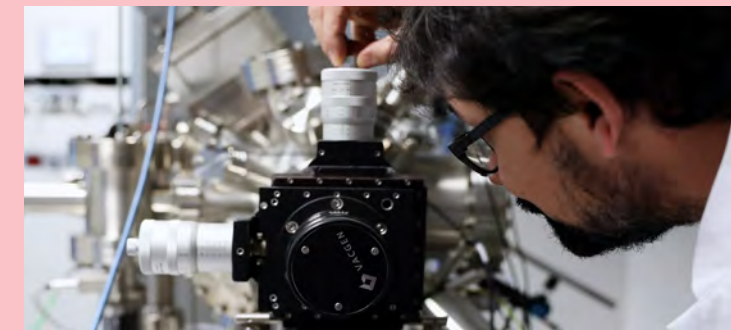
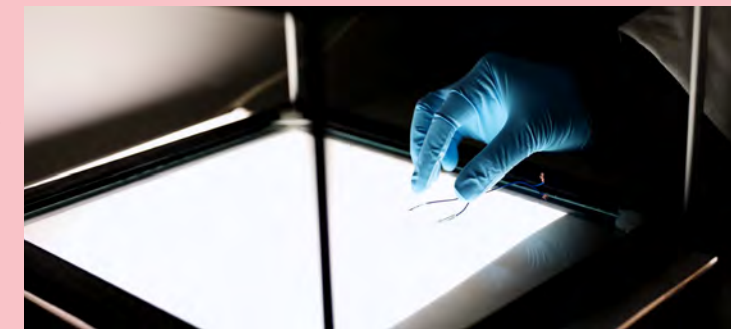
This cluster studies the physics of partially ordered and responsive materials, with structures often arising without external assistance (self-assembly and self-organization), in living systems as well as in inert materials. Our research comprises theoretical and experimental approaches, addressing problems that range from curiosity-driven fundamental research into why certain structures and peculiar behaviors arise in soft and living systems, to applied aspects where we explore means to improve society and environment through understanding adaptive, responsive or otherwise smart active materials.

SPECTROSCOPY & FUNCTIONAL MATERIALS

This cluster targets the investigation of novel materials in order to unveil the fundamental processes that govern and determine the properties of matter. The research groups employ a wide range of cutting-edge spectroscopic techniques in order to understand, design and control materials with important applications in future technology. The experimental activity is accompanied by advanced modeling of the fundamental phenomena to obtain a complete picture of the functioning mechanisms of materials and related devices.

STATISTICAL PHYSICS & MACHINE LEARNING

This cluster uses and develops statistical physics and machine learning to (i) design materials that can undergo dramatic and controllable changes in their properties (e.g. magnetic, optical, rheological), (ii) develop new methodologies to accurately compute long range intermolecular forces, (iii) understand collective behaviors in interacting living systems (e.g. molecules, cells, animals, populations), (iv) design efficient and reliable quantum and classical computing schemes.



Studying at our University

Young, dynamic and international



DISCOVER THE

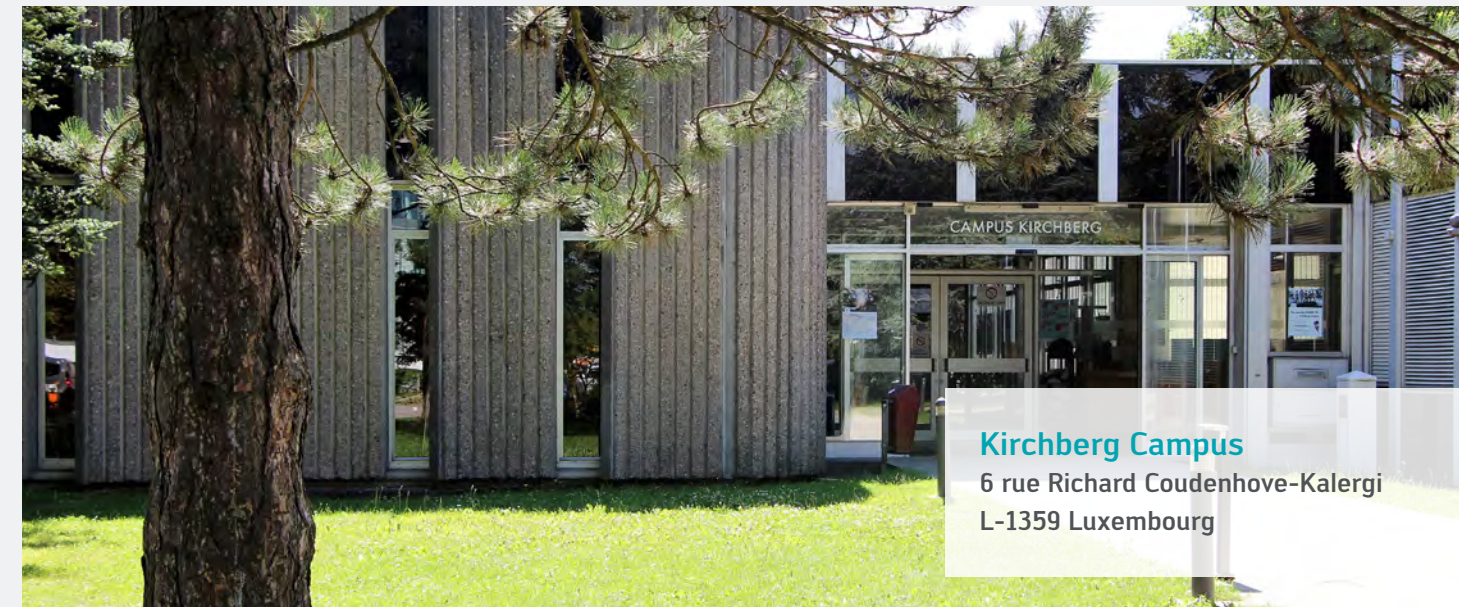
UNIVERSITY OF LUXEMBOURG

With more than 6,780 students from all over the world, the University of Luxembourg has an international and multilingual character that offers its students a higher search-oriented education.

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 Faiencerie
L-1511 Luxembourg



Discover Luxembourg

Great place to live and work



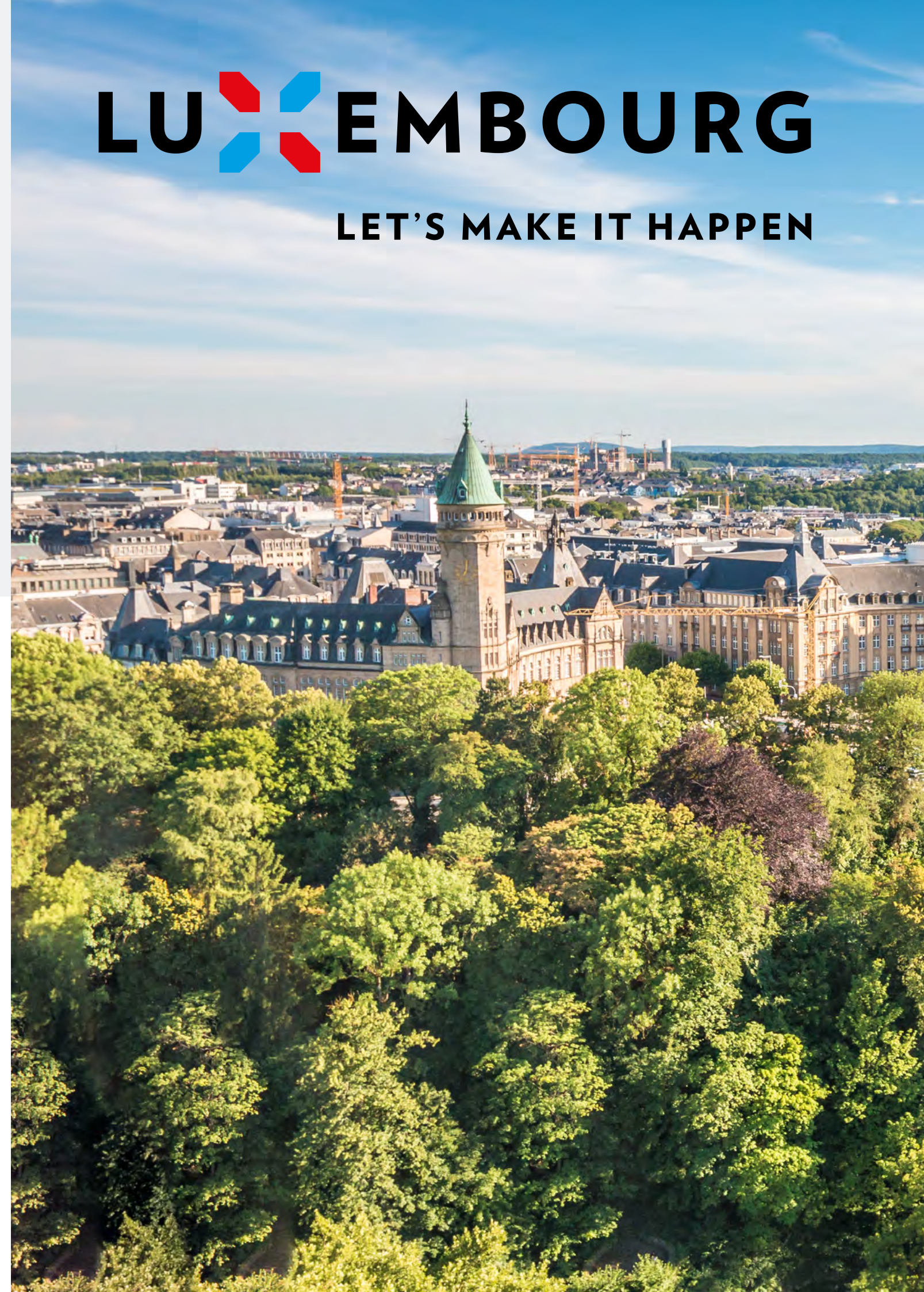
Located in the heart of Europe, the Grand Duchy of Luxembourg boasts a colourful history, stunning landscape, multicultural environment and multilingual population. The thousand year old capital and five regions each have their own unique flavour and discoveries to be made. Experience contemporary and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

visitluxembourg.com



LU EMBOURG

LET'S MAKE IT HAPPEN



University of Luxembourg

Faculty of Science, Technology and Medicine

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

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

Campus Limpertsberg
162 A, avenue de la Faïencerie
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University of Luxembourg
Multilingual. Personalised. Connected.

