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**INTERNATIONAL EXCHANGE PROGRAM**  
GRADUATE PROGRAM TAUGHT IN ENGLISH

# MULTISCALE MATERIALS

**FROM ATOMS  
TO ADVANCED DEVICES**

**1**

## MEET THE EXPERTS

Learn from an internationally renowned faculty involved in top class laboratories at the forefront of innovation.

**2**

## ACQUIRE ADVANCED SKILLS...

...to tackle engineering challenges with a multiscale approach based on a combination of theoretical, computational and experimental methods.

**3**

## TAKE ADVANTAGE OF THE GREAT ECOSYSTEM

At the heart of the Lorraine region, Nancy is located between Belgium, Luxembourg, Germany, and is 1h30 from Paris by TGV-Est. Lorraine is at the center of the European Valley of Materials, Energy and Processes, and offers a large set of tools for research, innovation and industry in these fields.

**4**

## RESEARCH AND INNOVATION

Benefit from our close collaborations with Institut Jean Lamour, one of the most renowned laboratories for fundamental and applied research in materials science and process engineering in Europe.

# 8 REASONS FOR STUDYING AT MINES NANCY!

**5**

## PREPARE YOUR FUTURE CAREER

60% of students hired before graduation: Mines Nancy offers close interaction with industry, through lectures given by our industrial colleagues and the possibility to perform research projects in collaboration with industrial partners.

**6**

## LIVE A MULTICULTURAL EXPERIENCE

This English curriculum is open to and popular with local French students. You will also mix with students from all around the world, as 25% of Mines Nancy students come from over 20 different countries.

**7**

## MINES NANCY WELCOME PACK

The teachers, staff and students of Mines Nancy are looking forward to welcoming you. Many services and social events are organized for international students to help you settle in and feel comfortable. An optional French summer school is also available for you to feel even more at ease.

**8**

## ENJOY NANCY

Nancy is renowned throughout the world for its Unesco-listed Place Stanislas. This Capital of Lorraine is a wonderfully charming and dynamic city with more than 40000 students. There are more than 60 clubs and student societies at Mines Nancy (sports, arts, social events, professional activities...).

# WHY MINES NANCY?



The international program “Multiscale Materials” covers the science and engineering necessary to characterize and model the properties of a wide range of materials such as metal and alloys, polymers, ceramics, composites, biomaterials and nanomaterials. It highlights the relationships between materials structure and their mechanical and physical properties and functionalities. Bridging multiple length-scales, this program addresses fundamental aspects as well as cutting-edge applications in multiple areas, including biotechnologies, nanotechnologies, and structural materials.

The development of industrial systems and the design of sustainable devices are a major strategic challenge for our societies. “Multiscale Materials” provides the tools to choose the appropriate materials, as well as design and manufacture them to optimize their bulk or surface structures, properties and functionalities for a wide range of targeted applications.

The Multiscale Materials program is hosted by Mines Nancy, one of the best French Graduate Schools of Engineering, which is at the crossroads between academia and industry. Mines Nancy is renowned for the high quality of its educational programs. Students receive customized tutoring in small groups and benefit from our proximity with Institut Jean Lamour a top-level laboratory for fundamental and applied research in materials science and processing, and with the high-performance computing center Explor. More than 1800 scientific instruments are available to students.

Built at the heart of a historic district in Nancy, the new campus gathers the 3 schools of the ARTEM Alliance (the National School of Art and Design in Nancy, ICN Business School and Mines Nancy) and Institut Jean Lamour. It represents a total of 5,000 people, including 3,500 students and 1,500 professors, researchers, administrative and technical staff. Located on the borders of several European countries and close to Paris (90min by high-speed train), Mines Nancy is at the core of the European Valley of Materials, Energy and Processes, which provides a large set of tools for research, innovation and industry in the field of materials science, energy and industrial processes.

**Emilie Gaudry**

Head of program

# PROGRAM ID

## At a glance

- **From fundamental science to engineering**
- **From the atomic scale to applications**
- **A wide range of advanced materials**

The program provides deep scientific and engineering knowledge to understand how the materials structure at various scales influences their structural and functional properties. It also provides ideal training for innovative applications in areas such as bio-, nano-technologies, etc.

## Language

English

## Duration

2 semesters

## Program Schedule

**Semester 1:** Lectures and projects (30 ECTS)

**Semester 2:** Full time internship (30 ECTS)

## Your career

**Academic careers as well as careers in industry.**

**Positions:** R&D, project manager, consultant, researcher, etc.

This program also provides a strong foundation for those who wish to pursue a PhD degree in Materials Science or in related fields.

# PROGRAM

## EMBRACE THE WORLD OF MULTISCALE MATERIALS!

New materials are sought-after for many applications and they have to comply with increasingly specific demands. The desired features often inherently require the use of advanced materials, due to multiple or seemingly contradictory targeted properties. Their rational development requires a deep understanding of their structure and properties at multiple length-scales, which is addressed by the international program «Multiscale Materials».

### Program Schedule

#### Core Courses

**Materials by Design** (21 hrs - 2 ECTS) The art of selecting and optimizing a material for a specific application.

**Materials Characterization** (21 hrs - 2 ECTS) The knowledge to select and assess the relevance of a wide range of techniques for materials characterization.

**Multiscale mechanics** (21 hrs - 2 ECTS) The goal is to predict the mechanical behavior of materials and their macro-structure using a scale transition approach.

**Devices at different length-scales** (21 hrs - 2 ECTS) Nano-scale to macroscopic innovative devices, in a wide range of fields.

**Modeling at the atomic and molecular scales** (21 hrs - 2 ECTS) This lecture includes practical sessions based on computational techniques as well as more fundamental underlying theories.

**From surfaces to coatings** (21 hrs - 2 ECTS) Introduction to the physics of solid surfaces, as well as the processes for preparing coatings by vapor deposition.

**Materials Forming** (36 hrs - 4 ECTS) The strategies to shape and dimension an object, considering the possible plastic deformations.

#### Elective courses

**Superconductors** (36 hrs - 4 ECTS) Superconductors properties and more advanced theories to understand this specific state of matter

**Biomimicry** (36 hrs - 4 ECTS) Introduction to emulating nature's time-tested patterns and strategies

#### Industry and Business project & seminars

**Artem Insight** (1 ECTS) 1 week dedicated to the development of one project proposed by an enterprise or an organization

**Economics, Organization, Business seminar** (1 ECTS) 1 week dedicated to seminars in the field of Economy, Organization or Business

**1 research project** in close connection with a research laboratory (100 hrs - 8 ECTS)

### Aims and skills

We use state-of-the-art computational tools combined with an in-depth discussion of experimental techniques to probe, understand and design advanced materials with targeted properties. While the first semester is dedicated to lectures and project, the second semester is entirely dedicated to a research internship that can be performed within partner institutions, either academic or industrial groups.

### French Summer School

**Date:** From July until end of August 2017

On an optional basis, Mines Nancy proposes a French Summer School to provide international students with the necessary skills in French. These courses are also tailored for engineering studies (methodological tools, professional language...).

Fees and registration procedure will be given in due course by Mines Nancy.

### Close connection with research Lab

All courses, projects and internships are connected to main materials Labs or industrial research centers such as :

- Institut Jean Lamour
- Institut Jean Barriol
- LCPME
- LEMTA
- LEM3
- LMops
- CEATech Grand Est

## HOW TO APPLY?

### Application deadline

Application for enrollment in September (semester 1): **15th April**

### Application

- **Application form duly completed**
- **Official transcripts** (in English)
- **CV and cover letter** (in English)
- **Copy of passport**
- **Proof of Language Proficiency** (compulsory minimum B2)

### Entry requirements

**Candidates should have achieved 4 years of higher education in Materials Science and Engineering, with excellent academic records.**

Background in Physics, Chemistry, Mechanical Engineering or a related field can be considered if the applicant can demonstrate skills in Materials Science and Engineering.

## FEES AND FUNDING

according to 2016/2017 fee regulations

### Within a bilateral agreement

**Erasmus exchange students: Free**

### Non-EU exchange students: Free

**excluding compulsory National French Health Insurance** (215€ in 2016/2017)

### Free movers

**EU/EEA: 610€**

**excluding compulsory National French Health Insurance** (215€ in 2016/2017)

**Overseas: 610€**

**excluding compulsory National French Health Insurance** (215€ in 2016/2017)

### Additional services for all students

**Additional fees (500€) will apply to all students once admitted in this program, on registration.**

### Funding

**Funding program awarded on the base of academic excellence.**

### Lifelong learning

**Tuition fees: 7416€**

**excluding registration fee (610€ in 2016-2017)**

## CONTACT

### International Office:

mines-nancy-dai@univ-lorraine.fr

### Student Mobility Coordinator, Incoming Students:

Marion Carrey

marion.carrey@mines-nancy.univ-lorraine.fr

Tel. +33 (0)3 55 66 26 76

## WELCOME PACK

**Mines Nancy offers individual and personalized support throughout the mobility.**

- **Accommodation & administration support** (immigration, registration...)
- **Personalized welcome from the railway station to accommodation**
- **Help with arrival in Nancy** (bank account, insurances, phone, internet...)
- **Educational mentoring**
- **Buddy programme**
- **International week end**
- **Social & cultural activities**
- **Intercultural Days**
- **French Summer School**





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### **CONTACT**

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