

EMNantes



V NTSE

**Nuclear Engineering:
Technologies, Safety
and Environment**



ECOLE DES MINES DE NANTES

The NTSE option



The principal mission of the NTSE option naturally consists of training engineers to work in the major corporations and institutions in the nuclear field. France, where electricity is largely produced in nuclear power stations, is present in all the phases of the fuel cycle and has a full range of facilities presenting various risks. The safety systems at these facilities must be designed according to the nature and magnitude of the hazards. But the option is not limited to the field of power production. It also covers other nuclear applications, including industrial and medical applications.

> Career Opportunities

The option covers all nuclear applications, and trains engineers for a wide range of careers essentially related to the nuclear field, where energy applications are predominant. The principal recruiters are:

- Major French nuclear groups: AREVA, through many of its subsidiaries, EDF, for power production activities (nuclear power plants) and decommissioning activities (EDF CIDEN).
- Consulting, engineering, testing and service firms such as ENDEL, ITENA, ALTRAN, ATR-Ingénierie, SOFREN, APTUS and Hémisphères, in particular in project management applied to decommissioning of nuclear facilities.
- Public industrial and commercial establishments such as the IRSN (French Institute for Radiological Protection and Nuclear Safety), ANDRA (French Agency for Radioactive Waste Management) and administrations such as the ASN (French Nuclear Safety Authority).



- The medical sector is likely to continue recruiting heavily, in particular in radiological protection. Students interested in becoming medical physicists can enroll in the Masters program in medical physics such the one offered by the University of Nantes and Ecole des Mines de Nantes (Master RIA: Ionizing radiations and applications).

Jobs for Tomorrow and the Future

The industrial sector offers a wide range of jobs:

- Safety engineer
- Project engineer
- Test engineer
- Control engineer
- Radiation protection engineer
- Technical sales engineer.



Abdesselam Abdelouas,
Program Head.

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“In addition to teaching the fundamentals of nuclear technologies and the technical aspects of nuclear safety, the option imparts a true culture of safety, incorporating the human factor and emphasizing environmental issues.”



> The Program

Due to the variety of potential jobs, the program does not specialize too quickly, but instead gives the students the necessary expertise in four areas:

- **Nuclear physics**
- **Modeling**
- **Laws and regulations**
- **Working in research groups**

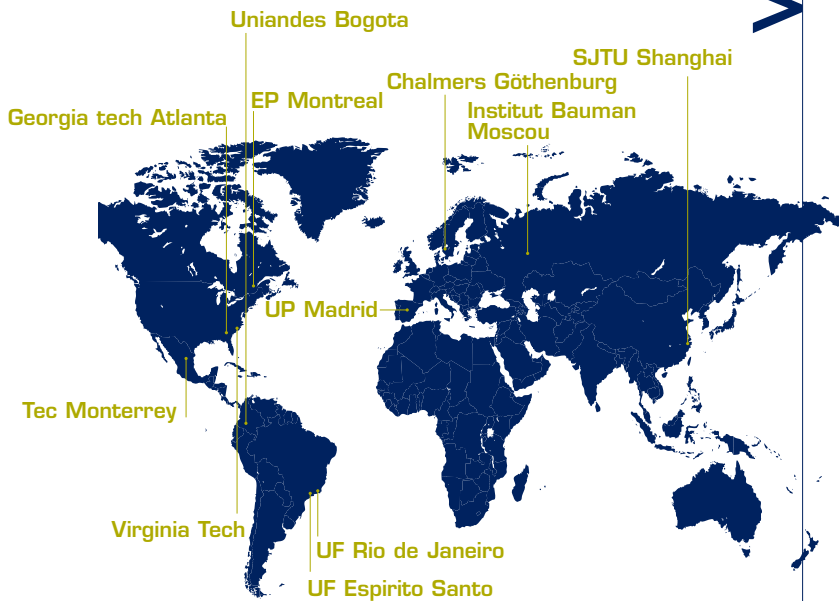
The program is based on knowledge acquired during an initial specialization. The goal of this initial cycle is to teach the students the theoretical concepts needed to understand nuclear reactions and to become expert at detection and analysis technologies. After a phase on subatomic physics, the interaction of radiation with matter and fuel cycle physics and chemistry, emphasis is clearly placed on experimentation and situation scenarios, both to understand nuclear reactions and to learn more about the techniques used.

The international program is a highlight of the option, in particular through international projects organized by the students in countries such as the Czech Republic, Ukraine, China, the USA, the UK, Germany, and Belgium. The students are entirely responsible for managing these projects, including the financial aspects, so that they can develop skills in this aspect of the program, which is highly valued at the Ecole de Mines de Nantes. Topics addressed include safety in nuclear power plants in Eastern European countries, the development of nuclear power in China, the energy policy in the United States, and power plants decommissioning in the United Kingdom, Germany and Belgium.

NUCLEAR REACTORS AND ACCELERATORS
PWR reactors
Nuclear materials
Theoretical concepts of accelerators
MANAGEMENT AND DISPOSAL OF NUCLEAR WASTE
Nuclear waste management
Nuclear waste disposal
Radiological impact and transfer of radioisotopes to the environment
Decommissioning of nuclear facilities
SAFETY AND RADIATION PROTECTION
Safety of nuclear facilities
Modeling of nuclear reactions
Radiation protection
INTERNATIONAL PROJECT
International projects related to industry or research

> Beyond Borders

France has an international reputation when it comes to civilian nuclear facilities. NTSE graduates can work abroad, where corporations such as AREVA and EDF are strongly established. Numerous opportunities are available in the United States, the United Kingdom, Germany, and in countries that have recently begun investing in a civilian nuclear program, such as China.



> Double degrees



“A Driving Force in all the phases of the project”

Katell Sablé, head of the Risk Prevention department at the Paluel nuclear power plant.

“One of the activities of our department is regulatory monitoring to make sure the site is in compliance with radiation protection, security, transportation and fire regulations. Hélène Legrand began her industrial project shortly after the publication of the decree of 26 October 2005, which redefined the methods for testing radiation protection instruments. This had an enormous impact on our practices and documents.

Hélène performed her assignment incredibly well, doing work not of an intern, but of an engineer. She fitted in well with the team and was quickly able to work independently. She was a driving force in all the phases of the project, from the problem solving phase through to implementation of the solutions. She spent a lot of time in the field, meeting with technicians to make sure the solutions were appropriate. We gave her training in level 1 radiation protection, so she was able to enter controlled areas.”

> Research

Students interested in research can continue their studies and obtain a Master of Science at the Subatech department (Subatomic Physics and Related Technologies Laboratory). The MSc concerns physics of materials, nuclear and subatomic physics. Students can then join PhD programs.



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