



Master of Science

Chemistry and Chemical Engineering Nuclear Chemistry, Radioactive Waste Processing

KEYWORDS

Radioactivity, energy, nuclear fuel cycle, nuclear chemistry, high technology, advanced materials, nuclear waste management.

OBJECTIVES

Acquisition of the chemical and nuclear knowledge needed to enable current and future technologies developed in the field of the nuclear fuel cycle, and additional knowledge related to the other applications of radioactivity (health, food irradiation, analysis, control, etc.). Students will also receive the additional training necessary for their professional insertion into these high technology industrial sectors and gain perspective and understanding in business management, economics and risk assessment.

PRE-REQUISITES (SCIENTIFIC AND LANGUAGE)

Candidates must have a Bachelor-level scientific diploma in chemistry or a degree equivalent. Foreign students must have a minimum level of knowledge of the French language (level 2 of the test TEF).

PROCEDURE AND ADMISSION

For Chinese students, the selection is based on the examination of an application form, written tests and an interview co-organised in Beijing with Tsinghua University. The final decision of admission is taken by the CEA and the sponsoring organisations or enterprises. The applications must be submitted by mid May.

For the students admitted according to the above mentioned procedure, the tuition fees and the travel to France and the living expenses in France will be covered by grants proposed by the industrial partners.

For other foreign students, the selection is based on the examination of an application form. The applications must be submitted at least two months before each six-month period.

Tuition fees are 15000 Euros for the four semesters of the programme. Candidates with a degree higher than the level stipulated as a pre-requisite may be exempted from the first period.

The application form can be obtained from Mr. Gérard COTE: gerard-cote@enscp.fr

LOCATION OF STUDIES AND TRAINING LANGUAGE

Theoretical training:
ParisTech-École Nationale Supérieure de Chimie de Paris
Experimental training:
CEA-INSTN

Training language: French

ACQUIRED SKILLS AND FUTURE JOBS

Acquisition of multi-disciplinary skills in research and development, in chemistry and radiochemistry of the nuclear fuel cycle and in other applications of radioactivity. Knowledge of the network companies and research laboratories involved in the field, in an international context.

Future jobs: High level scientists in research or engineering in companies operating nuclear power or using radioactivity to diverse ends (medical, food irradiation, etc.).

PROGRAMME

The programme lasts 20 months, in four periods, and correspond to a total of 120 ECTS credits:

- The first period (M1-S1) gives the required background in scientific knowledge

(mathematics, basics of quantum chemistry, chemical engineering, chemistry and physics of materials, physicochemistry of solutions, organic chemistry, introduction to radioactivity, programming data-processing and modelling) and linguistics: French, foreign language (FFL) for the foreign students: minimum level 2 with the TEF ; English is required for all students with minimum level of 500 to the TOEIC. All or part of this knowledge can be acquired at ENSCP within the framework of the Master or must have been acquired elsewhere. In particular, this first period can be prepared at Tsinghua University, in the frame of a This first period can be prepared at Tsinghua University.

- The second period (M1-S2) gives the scientific knowledge necessary in the nuclear field. This includes radioactivity and nuclear chemistry, spectroscopies, phase transformations in solids, mechanical properties and structure defaults, inorganic chemistry, surfaces and interfaces, separation science, molecular modelling, experimental training in radioactivity and nuclear chemistry, linguistic formation [FFL and English] and initiation to company management. This cursus is completed with a data processing project and a two-month research project in laboratory in material science or in physicochemistry of solutions, applied to the nuclear field.
- The third period (M2-S1) includes courses of the specialty *chemistry and radiochemistry associated with the back-end of the nuclear*

fuel cycle, radioactive waste management: processes of nuclear chemistry, general knowledge of the nuclear fuel cycle, physico-chemistry in reactors and transmutation, physicochemistry of separations, materials for radionuclide immobilization, mechanisms for the evolution of a system of storage, metrologies specific to nuclear power, how to conduct experiments in nuclear chemistry or with radioactive materials. The students will also acquire a general knowledge of the engineering related to this field. The scientific programme is supplemented by linguistic formation, company management and communication.

- The fourth period (M2-S2) consists of a project at the end of studies within a company or other suitable entity related to the field of the specialty. The objective of this final stage is to enable students to approach, in a real situation, the activities close to those of the engineers or the researchers (manufacture, control, fundamental or applied research).

CALENDAR

Period 1 (M1-S1):
September of the year N to February of the year N+1
Period 2 (M1-S2):
February to June of the year N+1
Period 3 (M2-S1):
September of the year N+1 to February of the year N+2
Period 4 (M2-S2):
February to June of the year N+2

LEADING SCHOOL AND TRAINING TEAM

This French International Master is delivered by École Nationale Supérieure de Chimie de Paris and CEA-INSTN, in partnership with Tsinghua University. The French training team is under the responsibility of Mr Gérard COTE, Professor at ENSCP and Mr. Gilles MOUTIERS, Professor at CEA-INSTN. It includes researchers of ENSCP specialists in the fields concerned and external experts belonging to the organizations and companies that are partners of the Master.

PARTNERS

Commissariat à l'Énergie Atomique (CEA), Centre National de la Recherche Scientifique (CNRS), Institut de Radioprotection et de Sûreté Nucléaire (IRSN), Agence Nationale pour la gestion des Déchets Radioactifs (ANDRA), Centre d'études sur l'Évaluation de la Protection Nucléaire (CEPN), Électricité de France (EDF), AREVA.

ADDRESS URL

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