

# Master of Science in Nuclear Energy

*[www.master-nuclear-energy.fr](http://www.master-nuclear-energy.fr)*

**ParisTech**  
INSTITUT DES SCIENCES ET TECHNOLOGIES  
PARIS INSTITUTE OF TECHNOLOGY



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# Global context : a strong increase in the nuclear industry's recruitment needs

- ❖ Worldwide revival of the nuclear sector :
  - Nuclear option increasingly considered as a component of a reliable global low-CO<sub>2</sub> energy strategy
  - Renewal and/or life-extension of national nuclear facilities in many countries
  - A large fraction of skilled personnel nearing retirement age
  
- ❖ In the French Industry, for domestic and international projects :  
Recruitment targets have tripled<sup>(\*)</sup>, at all qualification levels  
and will remain high for at least the next 10 years

(\*) from 2006 to 2008

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# Master of Science in Nuclear Energy

- The most renowned academic institutions of the Paris area, involved in graduate and postgraduate nuclear education ...
  - ❖ **Université Paris-Sud**
  - ❖ **ParisTech (Ecole Polytechnique, ENSTA, Chimie Paris, Mines Paris, Ponts et Chaussées, Arts et Métiers)**
  - ❖ **Ecole Centrale Paris – Supélec**
  - ❖ **INSTN**
- responding to an EDF initiative to foster enlarged high level academic training dedicated to nuclear energy
- have built a consortium to design and implement an ambitious joint Master Program

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## Strong support from :

- **State and national agencies**
  - ❖ **Ministry of Higher Education and Research,**  
(in charge of the agreement as a national degree)
  - ❖ **CEA, CNRS**
- **Nuclear industry :**
  - ❖ **EDF** (including initial impulse and financial commitment)
  - ❖ **AREVA, GDF SUEZ**

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# General program information

- Opening : **September 2009**
- Location : **Paris Faculté des sciences d'Orsay**
- Duration : **2 years**
- Targeted number of students to be trained each year : **200**
- Admission of high-potential international students with a Bachelor level in one of the following fields :
  - ✓ **Physics**
  - ✓ **Mechanical engineering**
  - ✓ **Chemical engineering**
  - ✓ **Electrical engineering**

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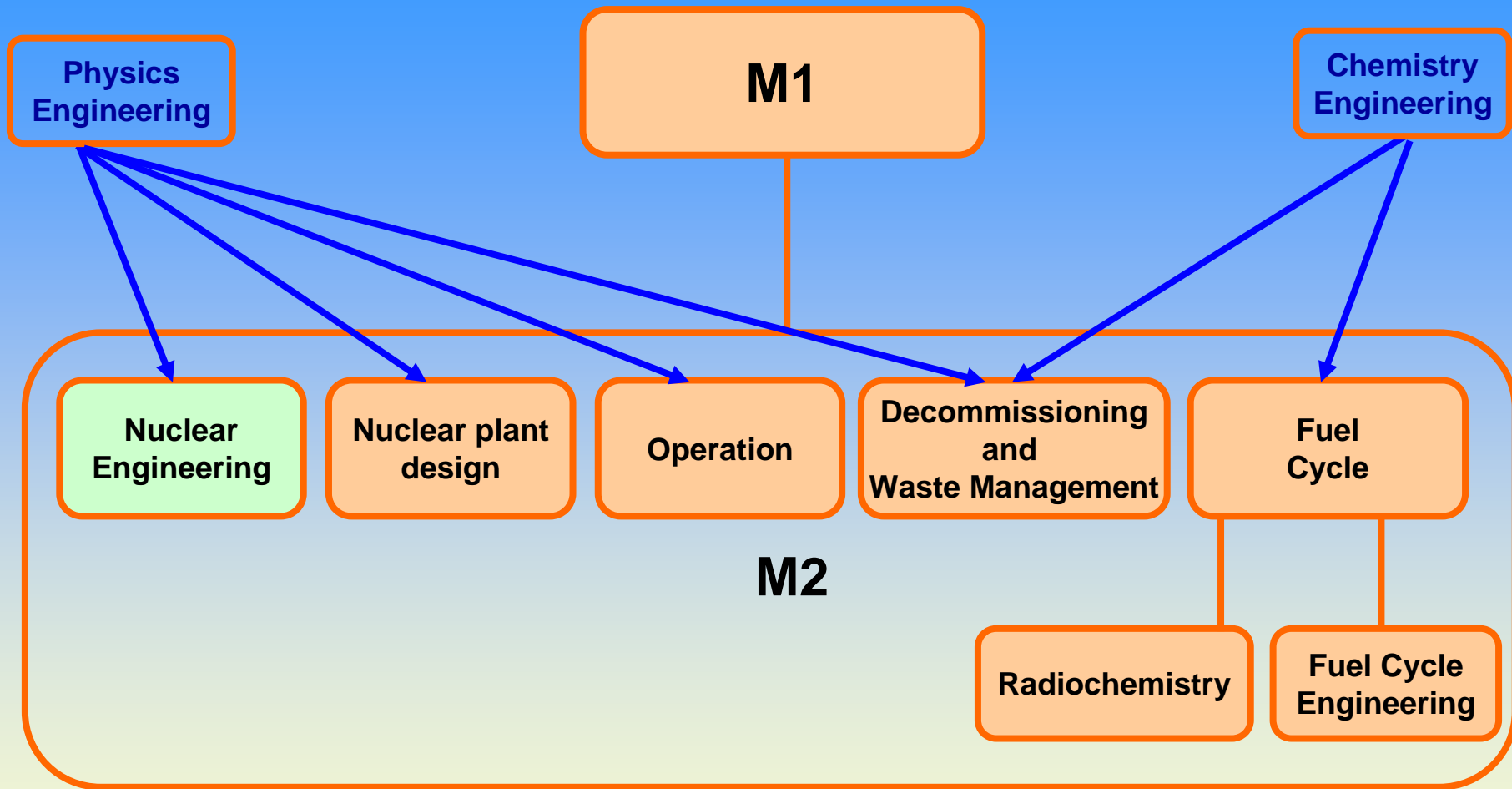


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# Program contents : 1<sup>st</sup> year

- Core courses
  - ❖ Nuclear physics, Neutronics
  - ❖ Fluid dynamics and heat transfer
  - ❖ Material science
  - ❖ Overview of energy technologies
  - ❖ Instrumentation & Control
  - ❖ Electrical engineering
  - ❖ Chemical engineering
  - ❖ Economics, project management
- Language and Culture courses
- Student project and internship (10 weeks)

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# Program contents : 2<sup>nd</sup> year

- **Core courses :**
  - ❖ Nuclear safety, Radioprotection
  - ❖ Project and risk management
  - ❖ Computer design and simulation
  - ❖ Environmental issues
- **Choice between 5 majors :**
  - ❖ Nuclear engineering
  - ❖ Nuclear plant design
  - ❖ Nuclear operations
  - ❖ Nuclear fuel cycle
  - ❖ Decommissioning and waste management
- **Experimental sessions and training on EDF simulators**
- **Visits of nuclear sites**
- **Master's thesis and internship (20 weeks)**
  - ❖ within an industry company (for students aiming at an industrial career)
  - ❖ within a research lab (for students aiming at a research career)

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## Second year (M2)

Core courses	ECTS
Introduction to safety	2
Functional description of a power plant	3
Risk management	5
Radioprotection	2
Environment and Society	5

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<i>Nuclear Engineering</i>	ECTS
Nuclear materials	5
Calculation codes for reactors	4
Thermo hydraulics	6
Neutronics 2	4
PWR-EPR and Gen VI reactors	4
Fuel cycle, safety, criticality, radiation protection	4

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<i>Nuclear Plant Design</i>	ECTS
Materials for nuclear plants	5
Radioprotection 2	3
Design, Calculation and testing	4
Thermo hydraulics	5
Design and construction of structures and infrastructures	4
Design-safety: General architecture, system and equipment	4

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<i>Operation</i>	ECTS
Facility control	5
Instrumentation and calculation codes	4
Radioprotection 2	3
Thermo hydraulics	5
Safety in Operation	4
Maintenance	4

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## Fuel Cycle

Radiochemistry	ECTS
Actinide electronic structure and speciation	4
Measurement strategy and methods	3
Physical-chemistry of nuclear materials	3
Thermodynamics	3
Physical-chemistry in reactor	3
Traces and ultra-traces analysis	3
Radio nuclides: migration in the geosphere	3
Radio nuclides behavior in biosphere	3

Fuel Cycle Engineering	ECTS
Waste conditioning	4
Process simulation and Process Control	4
Fuel: from the mine to the reactor	5
Waste management and repository design	4
Radioprotection 2	3
Nuclear Spent Fuel Recycling	5

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<i>Decommissioning &amp; Waste Management</i>	ECTS
Radioprotection 2	3
Politics, strategy and management of decommissioning	5
Instrumentation and calculation codes	4
Methods of decommissioning	4
Decommissioning Waste management	4
Decontamination and environment	5

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## Further information and contact

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