

*Welcome at
Mines Saint-Étienne!*



**MINES
Saint-Étienne**

Une école de l'IMT



Process Engineering & Artificial Intelligence

Master of Science

www.mines-stetienne.fr



**INSPIRING
INNOVATION**
SINCE 1816

A Master of Science (National Masters' Degree)
*Accredited by the French Ministry of Higher
Education and Research at the **École
Nationale Supérieure des Mines
de Saint-Étienne**, France*

 **Taught in English**

**Applications
for Eco-efficient Industrial
processes: to produce and use
cleaner, safer, and efficient energy**

This Master of Chemical Engineering is also partly focused on the study of industrial processes in relation with solid reactions (particles, powders, granular and porous media): studies ranging from micro to macro scale "From particles to processes"

A new Opportunity for international students

- Taught in English
- Master of Science diploma
- Main admissions in M2
- A key step for PhD studies



Course Structure

M1

- Fluid dynamics 17 ECTS
 - Fundamentals, turbulent and reactive flows, multi-phase flows
- Advanced Modeling and Numerical Simulation 7 ECTS
 - FEM, coupled problems, discrete mathematics
- Multidisciplinary modules 3 ECTS
- Study on process engineering software 5 ECTS
- Societal challenge, energy transition 10 ECTS
- Language Courses 6 ECTS
- Internship 12 ECTS

M2

- Chemical engineering for Energy production and conversion 17 ECTS
- Focus Process Engineering (elective course) 10 ECTS
 - Crystallisation, transfers in multiphase flows, discrete regulation, process design
- Focus Artificial Intelligence (elective course) 10 ECTS
 - Computation geometry, applications of image & pattern recognition, advanced statistics for process engineering, introduction to machine learning.
- Language Courses 3 ECTS
- Internship 30 ECTS

Past Internships

Opportunities

- Digital twins and image analysis for the numerical simulation of granular flow
- Scaling laws for pneumatic and hydraulic conveying of granular material
- Physico-Chemical study of the interactions between Polycarboxylate Ethers Superplasticizers and Organic Retarders in Calcium Sulfoaluminate (CSA) Cement



PhD subjects example

- Contribution of Artificial Intelligence tools to the modeling of granular flows
- Study of the kinetics and reaction mechanisms governing the over-oxidation of (U,Pu)O₂ mixed oxides
- Contribution of stochastic geometry for the morphometrical characterisation of particle

With the collaboration of the research center SPIN

Chemical Engineering and Natural Processes which gathers

22 faculty members

Labs

- Process for Environment and Geo-Ressources
- Powder Science and Technology
- Process for solid conversion and Instrumentation

Expertise, competences and skills

- Heterogeneous and granular dynamic systems,
- Multi-physics and multi-scales models, from nm³ to km³
- In line, in-situ and off-line physico-chemical characterisations
- Technology: from sensor to process designing, sizing and prototyping

20 PhD members

**4 analytical platforms, 1 technology platform,
1 nuclear room, 1 nano room**

- Digital for Eco Industry supports companies in their digital and ecological transition through a training offer and digital development consulting.
- PC2 : Powder and Physico-Chemical characterisations, / ESMAT : Solids Thermal Micro-Analyses,
- SAC : Spectro and Chemical characterisations, / OSP: 2D and 3D Models in GeoSciences
- HALLE-T2E2: Hall for Energy and Water technologies prototyping



Industrial partners

Orano, Totalenergies, Saint-Gobain, Imerys, Lafarge Holcim, Vicat

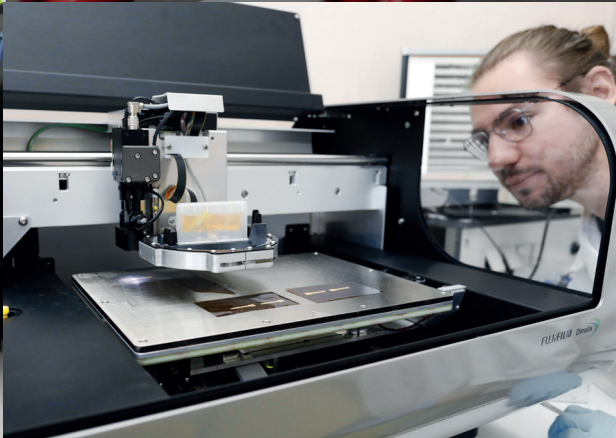


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La Région
Auvergne-Rhône-Alpes



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