

# Master in Materials Science and Engineering

## Track: MECHANICS OF MATERIALS FOR THE ENGINEERING AND INTEGRITY OF STRUCTURES (MAGIS)

### 2<sup>nd</sup> year of Master degree - Fall semester S1

All students may follow common core courses. In addition to these courses, all students **must choose only one option out of four**, each one consisting of fundamental and complementary courses:

- Option 1: **Damage and fracture of materials and structures**
- Option 2: **Metal processing and additive manufacturing**
- Option 3: **Life cycle of polymers and composite materials**
- Option 4: **Machining and simulation**

The course offer corresponds to the first half of the academic year, **fall semester (from September to January)**. Full year exchange possible, see at the end of the factsheet.

A minimum of **20 ECTS** (European Credit Transfer and Accumulation System) are **required for the learning agreement**.

**All courses** are taught in **English**.

Please note that courses are **place-limited**.

For information on the **requirements of each course**, please check the syllabus on our [website](#) or [here](#).

**Language courses** take place at **PSL engineering schools** (Mines Paris-PSL and ESPCI Paris-PSL) located near the **Panthéon** and the **Luxembourg Garden**.

Some **optional courses** may not be offered if the number of students is **too low**

**Scientific courses** take place at **various campuses**:

- **A&M - Arts et Métiers ParisTech**, located at: **151 Boulevard de l'hôpital, 75013 Paris**
- **UPS - Université Paris-Saclay (ENS or CentraleSupélec)**, located at: **4 avenue des Sciences or 3 rue Joliot Curie 91190 Gif-sur-Yvette** (same bus stop) **⚠ (Please note that this campus is located on the outskirts of Paris)**

When choosing your accommodation, please ensure that Gif-sur-Yvette and the 13th arrondissement of Paris are easily accessible. Please note that as some courses in Electives 2 and 4 are held at different ENSAM campuses in the French provinces, additional travel and temporary accommodation expenses shall be supported only by the exchange student.

## CORE COURSES

NSM23 - **Materials Science** (3 ECTS, A&M and UPS)

NSM24 - **Materials constitutive equations and thermodynamic of solids** (3 ECTS, UPS)

NSM25 - **Materials and structures computation by FEM** (3 ECTS, A&M)

NSM26 - **Advanced experimental methods** (3 ECTS, A&M and UPS)

NSM27 - **Research project** (3 ECTS, UPS)

NSM44E (or NSM44F if fluent in English) - **Scientific communication in foreign language** (3 ECTS, PSL)

## ELECTIVE 1 : DAMAGE AND FRACTURE OF MATERIALS AND STRUCTURES

All courses are eligible for selection. From 1 onwards, with the possibility of attending all 3 courses.

- NSM28- **Fracture mechanics** (3 ECTS, UPS)
- NSM29- **Damage and fracture of polymers and composites** ( 3 ECTS, UPS)
- NSM31- **Continuum damage mechanics** (3 ECTS, A&M)

Only **one** course from the list below can be selected.

- NSM32- **Plastic strain processing** (3 ECTS, A&M)
- NSM37- **Processing of polymers and composites** (3 ECTS, A&M)
- NSM30- **Dynamic behaviour and failure of materials** (3 ECTS, UPS)
- NSM35- **Algorithmic modelling of multi-physical processes** (3 ECTS, UPS)
- NSM41- **Fatigue of materials** (3 ECTS, A&M)
- NSM42- **Eco-materials** (3 ECTS, A&M and UPS)

## ELECTIVE 2: METAL PROCESSING AND ADDITIVE MANUFACTURING

<p>All courses are eligible for selection. From 1 onwards, with the possibility of attending all 3 courses.</p>	<p>Only <b>one</b> course from the list below can be selected.</p>
<ul style="list-style-type: none"> <li>• NSM33- <b>Metal additive manufacturing</b> (3 ECTS, A&amp;M)</li> <li>• NSM34- <b>Numerical simulation for metal processing</b> (3 ECTS, A&amp;M)</li> <li>• NSM43- <b>Manufacturing processes: Casting and forge*</b></li> </ul> <p>*incl. two full-weeks of courses in ENSAM campus located in ANGERS (city in the west of France): travel and temporary accommodation expenses shall be supported <u>only</u> by the exchange student</p>	<ul style="list-style-type: none"> <li>• NSM31- <b>Continuum damage mechanics</b> ( 3 ECTS, UPS )</li> <li>• NSM32- <b>Plastic strain processing</b> (3 ECTS, A&amp;M)</li> <li>• NSM37- <b>Processing of polymers and composites</b> (3 ECTS, A&amp;M)</li> <li>• NSM30- <b>Dynamic behavior and failure of materials</b> (3 ECTS, UPS)</li> <li>• NSM35- <b>Algorithmic modelling of multi-physical processes</b> (3 ECTS, A&amp;M)</li> <li>• NSM41- <b>Fatigue of materials</b> (3 ECTS, A&amp;M)</li> <li>• NSM42- <b>Eco-materials</b> (3 ECTS, A&amp;M and UPS)</li> </ul>

## ELECTIVE 3: LIFE CYCLE OF POLYMERS AND COMPOSITE MATERIALS

<p>All courses are eligible for selection. From 1 onwards, with the possibility of attending all 3 courses.</p>	<p>Only <b>one</b> course from the list below can be selected.</p>
<ul style="list-style-type: none"> <li>• NSM36- <b>Durability and recycling of polymers and composite</b> (3 ECTS, A&amp;M)</li> <li>• NSM37- <b>Processing of polymers and composites</b> (3 ECTS, A&amp;M)</li> <li>• NSM38- <b>Mechanical behavior of polymers</b> (3 ECTS, A&amp;M )</li> </ul>	<ul style="list-style-type: none"> <li>• NSM31- <b>Continuum damage mechanics</b> (3 ECTS, UPS)</li> <li>• NSM32- <b>Plastic strain processing</b> (3 ECTS, A&amp;M)</li> <li>• NSM30- <b>Dynamic behavior and failure of materials</b> (3 ECTS,UPS)</li> <li>• NSM35- <b>Algorithmic modelling of multi-physical processes</b> (3 ECTS, A&amp;M )</li> <li>• NSM41- <b>Fatigue of materials</b> (3 ECTS,A&amp;M)</li> <li>• NSM42- <b>Eco-materials</b> (3 ECTS, A&amp;M and UPS)</li> </ul>

## ELECTIVE 4 : MACHINING AND SIMULATION

Course eligible for selection	Only <b>one</b> course from the list below can be selected.
<ul style="list-style-type: none"> <li>• NSM32- <b>Plastic strain processing</b> (3 ECTS, A&amp;M)</li> <li>• NSM39- <b>Multi-physical approach of cutting, materials and material integrity*</b></li> <li>• NSM40- <b>Advanced machining and its applications*</b></li> </ul> <p>*incl. two full-weeks of courses in ENSAM campus located in CLUNY (small town in central-eastern France in the Bourgogne-Franche-Comté region): travel and temporary accommodation expenses shall be supported <u>only</u> by the exchange student</p>	<ul style="list-style-type: none"> <li>• NSM31- <b>Continuum damage mechanics</b> (3 ECTS, A&amp;M)</li> <li>• NSM32- <b>Plastic strain processing</b> (3 ECTS, A&amp;M)</li> <li>• NSM37- <b>Processing of polymers and composites</b> (3 ECTS, A&amp;M)</li> <li>• NSM30-<b>Dynamic behavior and failure of materials</b> (3 ECTS, UPS)</li> <li>• NSM35-<b>Algorithmic modelling of multi-physical processes</b> (3 ECTS, A&amp;M)</li> <li>• NSM41- <b>Fatigue of materials</b> (3 ECTS, A&amp;M)</li> <li>• NSM42- <b>Eco-materials</b> (3 ECTS, A&amp;M and UPS)</li> </ul>

### Full-year exchange - Spring semester S2

If European or International exchange students wish to do a **full-year exchange**, please note that the second semester (February-August period) is entirely dedicated to a 5-6 months period of internship (position and stipend to be found by the student during the first semester ).

This internship position is evaluated in the form of a final report and an oral presentation for 30 ECTS if it is validated. Please note that the NSM27 - Research project course (3 ECTS) may be linked to the internship subject set up during the first semester (bibliographical research, familiarisation with the subject).

### Full-year exchange – Spring semester S2

NSM45 – **Internship** (30 ECTS)