# 10-month Research Engineer

# Application of optimization algorithms and Artificial Intelligence to optimise elaboration by additive manufacturing of natural flax long fibre composite

## ANR FLOEME project context

The main objectives of FLOEME Project, funded by French Research Agency (ANR) are to optimize the mechanical performances of the fibres coming from the technical flax industry and to produce eco-responsible, high-performance and innovative continuous fibrous structures (yarns) for 3D printed load bearing composites. Currently, no commercial solution to manufacture continuous long flax fibre 3D printed composites is available. The consortium of 5 laboratories and one company will implemented a multi-scale and multi-physical approach to achieve these ambitious goals.

In this context, the four main scientific objectives of FLOEME are

- Understand which process steps of the processing chain generate the most defects
- Optimise the fibre extraction and transformation processes to minimise these defects and obtain the highest quality yarns as possible.
- Produce long-fibre 3D printed load bearing composite parts from the optimised yarns.

To reach these objectives, the consortium needs to

1. To design and manufacture dedicated fibrous structures (yarns) with long flax fibres for 3D printing
2. To identify and quantify kink-bands in fibres, yarns and composite materials parts
3. To monitor ultrastructure modifications of flax fibre due to processing
4. **To identify key parameters through the entire transformation chain (from extraction to integration into 3D composite part)**
5. To optimise printing of long flax fibre composite structures

## Description of scientific tasks

The post-doc activities will be dedicated to develop numerical tools to propose guidelines to others partners (objective n°4). Based on the observations and the measures conducted by the partners, the influence of defects on fibre and composite performances will be assessed using innovative Artificial Intelligence techniques (genetics algorithms, neural networks or optimisation algorithms) and statistical approaches (experimental design, multivariate analysis).

The objective of this study is to explore the contribution of artificial intelligence in the field of material mechanical on several aspects:

- Optimisation of process parameters
- Influence of kink-band parameters on mechanical properties of yarns
- Influence of defects on final structure mechanical performances

## Profile

Bac+5 graduated in the field of Mathematical and computer sciences, numerical mechanics or Artificial Intelligence. You have knowledge and skills in:

- Implementation and use of optimisation algorithms
- Deployment of AI models (neural networks, machine learning…)
- Knowledge of numerical calculation software (Matlab...) and programming languages (Python…)
- Ability to work independently and collaborate effectively within a multidisciplinary team.
- Good communication (writing/oral) in English and French

## Position in the organization:

The post-doc, recruited for 10 months from 4th march 2024, will carry out his/her activities at CIMAP Laboratory based in IUT Grand Ouest Normandie at Alençon, under the supervision of Dr. Florian GEHRING (Université de Caen Normandie, Alençon) and the coordinator of the ANR FLOEME project. Dr. Marwa ABIDA (University of Lorraine / ENIM, France) will be co-supervisor.

## Summary

**Temporary contract – 100% from 4th march 2024**
application deadline**: February 9th 2024**:
**Employer**: Université de Normandie
**Location**: IUT Grand Ouest Normandie, Pôle universitaire d'Alençon, Campus de Damigny (61250)
**Gross Monthly Salary**: 2400 €
Contacts for CV and letter of application

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Dr. Marwa ABIDA marwa.abida@univ-lorraine.fr

More details on FLOEME project: Linked FLOEME