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The **overarching objective** of the **NEWFRAC** network is a **high-level training** of a new generation of creative, entrepreneurial and innovative early-stage researchers (ESRs) **through the development and engineering applications of a new modeling framework focused on the prediction and analysis of multi-field fracture phenomena in heterogeneous engineering systems at different scales**

**NEWFRAC** is the first coordinated initiative in EU aiming at the systematic progress in the **failure prediction** in heterogeneous systems through a novel computational framework by integrating **Finite Fracture Mechanics (FFM)** and **Phase Field (PF)** modelling strategies

The **potential impact of this modelling and simulation framework** in the **design of heterogeneous materials and structures** can be enormous, for instance, in a **weight reduction** with respect to the current design concepts, increasing the ratios of strength/weight and stiffness/weight.

**Work Packages**

1. Management and Financing
2. Recruitment and Training
3. Communication, Dissemination and Exploitation
4. Novel tools for the prediction of fracture in heterogeneous materials
5. Innovative solutions to fracture problems in Energy, Health and Transport



**New strategies for multifield fracture problems across scales in heterogeneous systems for energy, health and transport**

**May 2020 - April 2024**

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Visit our website:  
**<https://www.newfrac.eu/>**

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## NewFrac Innovative Training Network

NewFrac provides intersectoral, interdisciplinary and international training for Early Stage Researchers (ESRs). **NewFrac network** is composed of **seven leading research groups (Universidad de Sevilla, Sorbonne Université, Universidade do Porto, Politecnico di Torino, Tel Aviv University, IMT Lucca and ETH Zürich)** and **five high-tech companies (Robert Bosch GmbH, FIDAMC + Bottero, Cubicoff, Safran)** with a special interest as end-users on the developments and outcomes of this network.

## The PhD Program:

The NewFrac Network is a 36-month PhD program, where students will have intersectoral and international training throughout Europe in leading laboratories and companies in the field. The main training events of the network are:

Main Training Events & Conferences	Venue	Date
CORE Winter School	Sevilla	Jan. 2021
1st NEWFRAC Workshop (WS1)	Sevilla	Jul. 2021
PRO Winter School	Lucca	Jan. 2022
Joint 2nd NEWFRAC Workshop (WS2) & TC08 - Numerical Methods (ESIS) Meeting	Lucca	Jan. 2022
Symposia on FFM and PF at the conference ECF23	Madeire	Jun. 2022
LEAD Autumn School	Torino	Oct. 2022
3 <sup>rd</sup> NEWFRAC Workshop (WS3)	Torino	Oct. 2022
Symposia of FFM and PF at the conference ICF15	Atlanta	Summer 2023
Symposia on FFM and PF at the conference CFRAC 2023	to be defined	Summer 2023
Final NEWFRAC Conference (FNFC)	Porto	Apr. 2024

Moreover, each ESR will have at least two secondments, one of them with an industrial partner.

## Innovative Training Network



## Early Stage Researchers and Individual Research Projects

Through **Individual Research Projects (IRP)**, **Early Stage Researchers (ESR)** will develop new failure-predictive computational tools, entailing multi-field, multi-material and multi-scale fracture analyses, and apply them to relevant problems in **strategic industrial sectors like energy, health and transport**.

**ESR1:** Total energy minimization with stress conditions for mixed mode fracture in anisotropic heterogeneous materials and structures. **Universidad de Sevilla (Spain), V. Mantič**

**ESR2:** Toughening composites by micro and meso structural optimization. **Universidad de Sevilla (Spain), I.G. García**

**ESR3:** Fracture analysis of advanced layered ceramics. **Sorbonne Université (France), D. Leguillon**

**ESR4:** Fracture of LFRP ultra-thin ply laminates in aeronautical applications. **Universidade do Porto (Portugal), P.P. Camanho**

**ESR5:** Nucleation and propagation of compressive cracks. **Sorbonne Université (France), C. Maurini**

**ESR6:** Multiscale modeling of fracture processes in injection molded SFRPs. **Robert Bosch GmbH (Germany), F. Welschinger**

**ESR7:** Debonding of the reinforcement in LFRP and FRMC externally strengthened beams. **Politecnico di Torino (Italy), P. Cornetti**

**ESR8:** Fracture in biological anisotropic hard tissues (human bones). **Tel-Aviv University (Israel), Z. Yosibash**

**ESR9:** Multi-field and multi-scale modeling of fracture for renewable energy applications. **IMT School for Advanced Studies Lucca (Italy), M. Paggi**

**ESR10:** Phase Field modeling of fracture in the human femur. **ETH Zurich (Switzerland), L. de Lorenzis**

**ESR11:** Analysis of the failure mechanisms associated to the unfolding failure in CFRP profiles. **FIDAMC (Spain), E. Graciani**

**ESR12:** Fracture in fibre-reinforced thermoplastics (FRTPs) across the scales. **Universidade do Porto (Portugal), P.P. Camanho**

**ESR13:** Phase Field and Finite Fracture Mechanics for fragmentation and dynamic crack propagation in brittle materials and composites. **Politecnico di Torino (Italy), M. Corrado**