



TRUSS
www.trussitn.eu

TRUSS (Training in Reducing Uncertainty in Structural Safety) is a Marie Skłodowska-Curie Innovative Training Network funded by the European Union under the Horizon 2020 Programme. TRUSS is structured into taught modules combined with original and impactful research supported by secondments that will give the successful candidates significant insights and exposure to research and innovation in both academia and industry.

EARLY STAGE RESEARCHER VACANCY:
ESR 3



Project Title:
**REDUCTION OF UNCERTAINTY IN DESIGN OF FREE
STANDING NUCLEAR SPENT FUEL RACK**

Host

Equipos Nucleares S.A. (ENSA)

Address

Design & Analysis Department; Av. Juan Carlos I, 8, Maliaño, 39600

Country

Spain

Main Supervisor

Mr. Luis Costas

Background

The desire to meet the requirements of an increasingly energy-hungry world without the carbon emissions associated with fossil-fuel-fired power plants brings nuclear energy into consideration. According to the World Nuclear Association, 502 additional nuclear reactors are expected to be operational by 2030.

Depending on the nuclear reactor design, removal of a quarter to a third of the nuclear fuel elements in the reactor is approximately every 12 to 24 months. The spent fuel elements are kept in wet storage pools until they are sufficiently cooled to permit them to be transferred to alternative dry intermediate storage or reprocessing sites. As part of ENSA activities in the nuclear power field, the *design of racks to store nuclear spent fuel in pool* is encompassed. Since the rack installation is in a dangerous (radioactive) environment with difficult access, the design is oriented *to make it as easy and quick as possible*. So the modern 'Free Standing' (just resting on pool floor) concept is promoted. To calculate forces and the sliding probability, under water during earthquakes, a non-linear transient dynamic with direct integration, using powerful computers, is required. **Several approaches have**



been used to date, but some dispersion of results still exists. As a result, the regulatory authorities are requiring an evaluation of the uncertainties in the methodology that TRUSS will address. In an initial phase, the dependence between structure mathematical model precision, the ANSYS direct integration solver type used, the several integration parameters involved in equation resolution and the uncertainty of results will be established. In a 2nd phase of collaboration with *UCD*, ANSYS results will be compared to other finite element (FE) code results to validate methodology, allowing a better knowledge of uncertainties inherent to FE code. In a 3rd phase, a statically sensibility analysis, using ANSYS, to input data, as friction coefficients, would be encompassed. In a final phase, *ENSA* would try to validate FEM results with test of full or scaled racks in collaboration with partners.

Objectives

The objective is quantifying the uncertainty in complex non-linear dynamic calculations of sliding structures under water using finite element (FE) code ANSYS. Experimental tests (from the most simple collecting vibration data from hammer shock test to a more complex collecting information from submerged rack on vibration table) will further contribute to increase the reliability of the results.

Expected Results

A quantification of the **uncertainty** in simulations of **complex dynamic cases of sliding structures**.

Secondment

This position involves a secondment of some months to University College Dublin (*UCD*). *ENSA* uses ANSYS FE code for evaluating the response of a free standing nuclear spent fuel rack. One source of uncertainty is derived from the dispersion of results by different FE packages/approaches. The ESR will use a different FE package and supercomputer facilities in *UCD* to estimate the uncertainty associated to these simulations.

Specific Requirements

- At the date of closure of appointments, candidates must have obtained, or finalize within 3 months, a 4-yr Bachelor or a Masters degree in Engineering, with a strong background in Structures.
- Prior knowledge and skills in programming are desirable but not mandatory.
- We are looking for candidates with a strong motivation to pursue a career in engineering and an open mind for new approaches and a lot of team spirit. Creativity and level of independence will be considered.
- Solid written and oral communication skills in English are prerequisites of any successful application. Some basic Spanish language is desirable, but not mandatory.

Eligibility Criteria

- Researchers can be of any nationality and age.
- All recruited researchers **must be Early-Stage Researchers (ESRs)**. A ESR shall, at the time

of recruitment by the host organisation, **be in the first four years of their research careers** and not yet have been awarded a doctoral degree. The four years start to count **from the date when a researcher obtained the degree which would formally entitle him/her to embark on a doctorate.**

- Researchers are required to undertake transnational **mobility** (i.e. move from one country to another) when taking up their appointment. One general rule applies to the appointment of researchers: **At the time of recruitment by the host beneficiary, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host beneficiary for more than 12 months in the 3 years immediately prior to the reference date. Note that the mobility rule applies to the beneficiary where the researcher is recruited, and not to beneficiaries to which the researcher is sent or seconded.**
- For all recruitments, the eligibility and mobility of the researcher will be determined at the time of their (first) recruitment in the project. The status of the researcher will not evolve over the life-time of a contract.

Salary and Working Conditions

- Each position is for a period of 36 months. These positions will be available from August/September, 2015. The Marie Skłodowska-Curie programme offers highly competitive and attractive salary and working conditions. Exact salary will be confirmed upon appointment. It consists of a living allowance (= 37320 euro/year [the Marie Skłodowska-Curie rules apply a correction factor to this amount to allow for the cost of living in different countries]) + a monthly mobility allowance (= 600 to 1100 euro/month depending on the family situation).
- Furthermore, PhD tuition fees for the ESR are covered and the research project is aimed at defending a thesis and obtaining a PhD degree. In addition to their individual scientific projects, all positions will benefit from further continuing training, which includes internships and secondments (All ESRs will be seconded at least once during this period at another partner site), a variety of training modules as well as transferable skills courses, active participation in workshops and conferences, and exposure to large enterprises, SMEs and Universities from different European countries involved in TRUSS.

Application Procedure

- (1) Check you meet **Eligibility criteria** and **Specific requirements for the ESR position** project/s you are applying for.
- (2) Prepare the following **application documents** (in English):
 - a. **A curriculum vitae**, including contact details, education (at University level and other), work experience, prizes/awards, language skills, etc... (max. 2 pages). The CV should reflect a representative array of achievements and qualifications appropriate to the post for which application is being made.
 - b. **Official academic record** of undertaken courses & grades for Bachelor (and Master if required in specific criteria) degree.
 - c. **A motivational letter** in which the applicant describes his or her motivation to



pursue postgraduate studies and to conduct the research project/s applied for. Mention the ESR project number or numbers (in the latter indicate order of preference if any) on your motivational letter and the subject of the email.

d. **A reference letter.**

- (3) Email your application documents as attached files to: trussitn@ucd.ie **before the 1st May 2015 deadline** and mention the ESR project number/s you are applying for in the subject line.
- (4) The documents provided will be used to select the best candidates. Successful candidates will be informed **before 29th May 2015.**

For more information on a position with TRUSS, please check www.trussitn.eu/vacancies or email trussitn@ucd.ie