



**TRUSS**  
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TRUSS (Training in **R**educing **U**ncertainty in **S**tructural **S**afety) 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 8**



Project Title:  
**PROBABILISTIC MODELLING OF BRIDGE DAMAGE  
BASED ON DAMAGE INDICATORS**

**Host**

Phimeca

**Address (Departmental address where ESR will be located)**

Centre d’Affaires du Zénith; 34 rue de Sarliève; F-63800 Cournon d’Auvergne

**Country**

France

**Main Supervisor**

Dr. Thierry Yalamas

**Background**

While in the 90’s, Structural Health Monitoring (SHM) projects were concerned only with the construction phase, nowadays, the main purpose of monitoring the structural response is to confirm design assumptions in new structures, and the controlled lifetime extension of existing structures. SHM systems provide indirect indicators of damage in bridges – for example, a change in a mode of vibration may indicate damage. There is an extensive literature in SHM, particularly in methods which use accelerometer signals as damage indicators, however, the *uncertainty associated to these damage indicators is unknown and will be investigated by combining Phimeca’s advanced uncertainty models with University College Dublin’s expertise in bridge analysis*. It is known that damage in bridges due to, for example, corrosion, is spatially correlated, i.e., if there is a high level of damage at a point, the probability of a high level of damage at an adjacent point is increased. This theory has been developed by O’Connor (*Dublin*) (who will advise in this project), Stewart and others. Damage indicators provide information on the location of the damage but this relationship between indicator and location is uncertain. Nevertheless, the probability density function for damage indicator often contains implicit information on damage location.

## Objectives

In this project, Bayesian Updating will be used to infer probabilistic information about the spatial location and level of damage throughout the bridge, given measurements of damage indicators. The results will include an allowance for the uncertainty in the damage indicator/location relationship as well as prior knowledge about the correlation between damage and location. Spatial correlation of traffic loading will also be considered and the effect of combining correlation information on load and resistance.

## Expected Results

Methods to more accurately evaluate **bridge safety based on traffic load and bridge condition measurements**.

## Secondment

This position involves a secondment of some months to University College Dublin (*UCD*). The *UCD* supercomputer facilities will assist the ESR in carrying out simulations and probabilistic calculations required for the project. *UCD* will advise on how to relate the spatial distribution of bridge safety to measured damage indicators in bridges.

## Specific Requirements

- At the date of closure of appointments, candidates must have obtained, or finalize within 3 months, a 4-yr Bachelor's or a Master's degree in Engineering, with a strong background in Civil or Structural Engineering.
- Prior knowledge and skills in programming are desirable but not mandatory.
- Solid written and oral communication skills in English are prerequisites for any successful application.

## 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](mailto:trussitn@ucd.ie) **before the 1<sup>st</sup> 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 29<sup>th</sup> May 2015**.

For more information on a position with TRUSS, please check  
[www.trussitn.eu/vacancies](http://www.trussitn.eu/vacancies) or email [trussitn@ucd.ie](mailto:trussitn@ucd.ie)