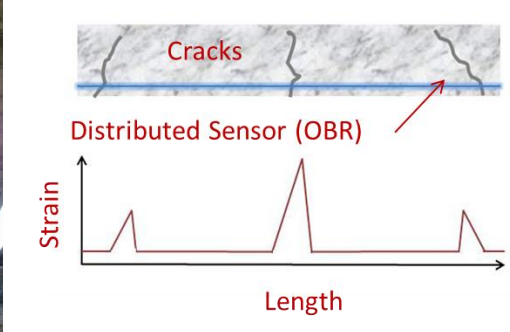




TRUSS
www.trussitn.eu

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 11



Project Title:
**DEVELOPMENT OF
OPTICAL FIBRE
DISTRIBUTED
SENSING FOR SHM OF
BRIDGES AND LARGE
SCALE STRUCTURES**

Host

Universitat Politècnica de Catalunya (UPC)

Address

School of Civil Engineering; c/Jordi Girona 1-3. Campus Nord. Modul C1; 08034 Barcelona

Country

Spain

Main Supervisor

Prof. Joan Ramon Casas

Background

The technique of fiber optic sensors has been used in Structural Health Monitoring (SHM) for 30 years. Over these years, the technique has been developed until obtaining measures with accuracy similar to the standard strain gages and extensometers. *The use of Optical Backscatter Reflectometry (OBR) is a promising measurement technology for Structural Health Monitoring (SHM) as it offers the possibility of continuous monitoring of strain and temperature along the whole fibre in comparison with local sensor placement (as the Bragg gratings).* OBR differs from other frequency-domain techniques in that it is sensitive enough to measure levels of Rayleigh backscatter in standard single-mode fiber. Several applications to materials used in the aeronautical construction have demonstrated the feasibility of such technique. These materials (composites, steel, aluminium), apart from having a smooth surface where the bonding of the sensor is easily carried out, they also have a continuous strain field when subject to external loading. **The feasibility of using OBR in SHM of civil engineering constructions made of concrete is even of greater interest, mainly because in**



this type of structures it is impossible to know where the cracks may appear and therefore severe cracking (dangerous for the structure operation) can appear without warning if local measuring sensors are not placed in the particular location where the crack appears. UPC will work with *Crack Ingenieria* to overcome some limitations in the application of such type of sensor to concrete structures such as (1) the roughness of the concrete surface and the heterogeneity due to the presence of aggregates of several sizes, and (2) the fact that reinforced concrete cracks at very low level of load, appearing as a discontinuity in the surface and the strain field that may provoke a break or debonding of the optical fiber. This technology has the ability to test a structure over extended gauge lengths.

Objectives

The objective of the project is to study the spatial resolution and strain accuracy obtained with optical distributed fibre when applied to concrete elements, and to see the potentiality of detecting crack or abnormal deflections without failure or debonding. Therefore, the most suitable bonding adhesives as well as the technique of attachment of the fibre to the concrete will be investigated. The long-term reliability of the sensor measurements will be investigated too. Finally, criteria for the design and deployment of a permanent monitoring system based on these sensors will be presented.

Expected Results

Criteria for the design and deployment of a permanent monitoring system based on the use of **Distributed Optical Fibers** and **Optical Backscatter Reflectometer for SHM**.

Secondment

This position involves a secondment of some months to *Crack Ingenieria*. The ESR will learn from *Crack's* practical experience on SHM and instrumentation, and in particular, on the use of the Optical Distributed Sensor Interrogator technology based on swept-wavelength coherent interferometry to measure temperature and strain using optical fiber.

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 on the basics of sensors and monitoring techniques will be desirable but not mandatory.
- Past participation on experimental tests (both at laboratory level or real structures) will be of interest
- 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.

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**