

## **PhD scholarship in collaboration with industry in “Risk reduction driven design and seismic assessment of critical infrastructures”**

The UME Programme offers a doctoral scholarship in collaboration with the EUCENTRE Foundation and GEODATA S.p.A. EUCENTRE is a non-profit foundation that collaborates with IUSS within the ROSE Centre (Centre for Training and Research on Reduction of Seismic Risk). GEODATA is an engineering company based in Turin and active in 25 countries, which has designed and followed the construction of over 4,000 km of tunnels and more than 3500 projects worldwide, including: bridges, dams and hydroelectric plants, traditional and high-speed railways, subways, roads and highways.

### **Advantages**

The scholarship in collaboration with the EUCENTRE Foundation and GEODATA aims to insert doctoral research within a vision of connections between the world of research and that of business. The main objective is to do research to solve new and applied problems, which have been identified during the design of relevant structures, which are typically difficult to frame in the regulatory environment. This scholarship will integrate the training of the doctoral student with research, development and innovation of the private sector.

### **Training**

The UME PhD programme includes a training part, through courses offered at IUSS, and a part of research that will be performed at the EUCENTRE Foundation and GEODATA. The training courses will be established by mutual agreement between IUSS faculty members, the PhD student, EUCENTRE and GEODATA.

### **Research Topic**

The proposed research programme provides the involvement of the candidate within a research group that includes IUSS faculty members and internal staff of EUCENTRE and GEODATA. The research topic is part of a broader research that can be described as "Risk reduction driven design and seismic assessment of critical infrastructures".

The design and construction of critical infrastructures (e.g. dams, tunnels, hydroelectric plants) is characterized by a high level of risk linked to different types of uncertainty (e.g. epistemic and aleatoric, seismic hazard and/or other natural hazards, etc.). Systematic risk assessment and management techniques can be used in the design phase with the objective to reduce the risks within an acceptable level. One of the main objectives of this research is the management of the risks related to damage of critical underground systems with the development of new approaches to study the nonlinear mechanical behaviour of underground structures (e.g. tunnels, deep foundations, underground systems of hydroelectric plants) subjected to cyclic loads (e.g. earthquakes and water loads). These structural systems are commonly designed using linear-elastic approaches, which do not directly allow to evaluate the damage for cyclic loads and, therefore, also the risks related to the loss of safety and functionality.

### **Constraints**

The awarding of the scholarship is conditional on the acceptance to carry out the research activities and the condition described above, foreseen by the project.