

PhD in INGEGNERIA STRUTTURALE, SISMICA, GEOTECNICA / STRUCTURAL SEISMIC AND GEOTECHNICAL ENGINEERING - 40th cycle

THEMATIC Research Field: MODELLING OF INTERACTION BETWEEN CABLE BURIAL MACHINE AND SUBSEA SOILS

Monthly net income of PhDscholarship (max 36 months)		
€ 1700.0		
In case of a change of the welfare rates during the three-year period, the amount could be modified.		

Context of the research activity		
Motivation and objectives of the research in this field	The primary motivation for this research stems from the increasing demand for reliable and efficient submarine cable installations, crucial for global communication and energy infrastructure. As seabed conditions vary significantly, the development of advanced models to predict the interaction between burial machines and subsea soils is essential. The objective is to develop a robust tool to optimize installation processes, enhance machine performance, and reduce operational installation delays. Additionally, this research aims at bridging gaps in current industry standards, implementing advanced technologies, like AI and Machine Learning, in standard procedures.	
Methods and techniques that will be developed and used to carry out the research	 The research will employ a combination of analytical, empirical, and numerical approaches to model the interaction between cable burial machines and subsea soils. In particular, the research will be based on the following steps: Critical review and interpretation of available data from public and corporate databases related to subsea soils and burial machines. The interpretation should be based on theoretical soil mechanics knowledge. Development of analytical models and empirical formulas to evaluate machine performance in different soil types, 	



	 supported by the creation of performance charts and engineering tables. Application of advanced numerical tools, including continuum based approaches accounting for large strain mechanics as well as Artificial Intelligence (AI) and Machine Learning techniques.
Educational objectives	The educational objectives of this doctoral research are to provide the candidate with in-depth knowledge and advanced skills in geotechnical engineering, offshore soil mechanics, and machine-soil interaction. Through the project, the candidate will: •Gain expertise in data analysis, soil characterization, and optimization techniques relevant to subsea environments. •Develop advanced modeling and simulation skills, particularly using large strain continuum based approach numerical tools (MPM/PFEM), Artificial Intelligence (AI) and Machine Learning tools. •Acquire a strong expertise in the engineering processes involved in submarine cable installation, with a focus on the practical application of theoretical knowledge. These objectives will equip the candidate with the technical and analytical skills necessary for both academic and industrial careers.
Job opportunities	Upon completion of this doctoral research, the candidate will be trained to successfully apply for job opportunities within both academic and industrial sectors, including: Offshore engineering, Geotechnical engineering and Research and Development (R&D).
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 2 PhD Students
Name of the research directors	Gabriele Della Vecchia, Pietro Marveggio

Contacts

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Additional support - Financial aid per PhD student per year (gross amount)		
Housing - Foreign Students		
Housing - Out-of-town residents (more than 80Km out of Milano)		

Scholarship Increase for a period abroad		
Amount monthly	850.0 €	
By number of months	6	

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): financial aid per PhD student per year. The Ph.D. course supports the educational activities of its Ph.D. students with an additional funding equal to 10% of the scholarship, starting from the first year.

Teaching assistantship: availability of funding in recognition of support to teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability: each Ph.D. student has his/her own computer for individual use.

Desk availability: each Ph.D. student has his/her own desk, cabinet and locker.