POLITECNICO DI MILANO

PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 38th cycle

THEMATIC Research Field: MODELING OF SMART COMPOSITE STRUCTURES FOR LARGE OFFSHORE WIND TURBINE BLADES

Monthly net income of PhDscholarship (max 36 months)
€ 1275.0
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	With the increase of offshore wind turbine farms performance, new generation of blades must exceed a length of 100m and this necessarily involves massive use of carbon composites. For the social importance and safety of these large offshore wind turbine blades, an accurate and continuous structural heal monitoring is mandatory. Intelligent composite materials embedding Fiber Optic Sensors and Quantum Resistive Sensors are proposed for continuous heath monitoring of such very large off-shore structures. The objective of the thesis is an accurate multiphysics numerical modelling of the composite materials and structures to design the proper sensors placement avoiding mechanical performance drawbacks, while having efficient structural health monitoring of components essential for the reliability of the blades.
Methods and techniques that will be developed and used to carry out the research	Advanced numerical models will be developed for the prediction of the macro and local mechanical response of fiber reinforced wind turbine blades. Dedicated techniques will be considered for the damage evolution simulation. Moreover, techniques for the application and simulation of

	the interaction of composite materials and sensors (e.g. Optical Fibers and by Quantum Resistive) will be developed for the blade structural health monitoring.
Educational objectives	The candidate is supposed to acquire competencies on: • advanced finite element modelling of anisotropic materials; • technique for modelling damage evolution in fiber reinforced composites; • electro-thermo-mechanical multiphysics numerical simulations; • methods and techniques for the design of structural health monitoring ofcomposite materials and structures.
Job opportunities	The skills acquired by the candidate during this PhD will be useful both in academic and industrial contexts dealing with research and design of fiber reinforced composite materials and structures and their structural health monitoring.
Composition of the research group	1 Full Professors 1 Associated Professors 0 Assistant Professors 2 PhD Students
Name of the research directors	Profs V. Carvelli & M. Drissi-Habti

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)	--

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Scholarship Increase for a period abroad	
Amount monthly	637.5 €
By number of months	12

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

Scholarship co-funded by Politecnico di Milano, ABC Department, and Université Gustave Eiffel, Paris

Additional information can be found in the Regulations for the 37th Cycle of ABC-PhD:
download is available at link:
https://beep.metid.polimi.it/web/abcphd/documenti-e-media

Additional information about ABC department and ABC-PhD programme:
available at link:
https://www.dabc.polimi.it/

Additional support for the research activity:
a total amount of 5.197,62 Euros per student, available since the first year, to be spent according to the department rules.

Desk availability:
the ABC department provides non-permanent desks to be temporarily booked in common PhD rooms. In particular, the activity related to this scholarship will be partially developed at Université Gustave Eiffel in Paris.