POLITECNICO DI MILANO

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

Number of scholarship offered	14
Department	DIPARTIMENTO DI ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO

Description of the PhD Programme

The Doctoral Program on Architecture, Built Environment and Construction Engineering (ABC-PhD) was established in 2012, heritage of five other programs active since the first institution of Dottorato di Ricerca in Italy that progressively merged in one with the aim to realize a national Point of Reference for training researchers and experts in our fields (progressively reaching this target).
Our vision wishes our PhD holders to become self-sufficient, independent "actors", able to gain as scientist, as intellectuals, as professionals, as entrepreneurs an outstanding position at an international level. ABC-PhD is one of the most multidisciplinary PhD program in Italy (it refers to 20 different scientific sectors) and trains about one hundred PhD Candidates (1/3 new ones each year).
Our Candidates are trained to face complex questions, to develop in depth analysis and reliable models (theories) of complex (physical, economic, environmental or social) systems and to innovate.
Their natural passion and their attitude toward innovation works as an active transmission system and activate a two-way knowledge transfer between the Academy and its stakeholders.
After their training, ABC-PhD Doctors are expected to be endowed not only with a high-level scientific knowledge and a significant experience in Research and Development (R&D) activities, but also with proven communication and management skills, and to become self-sufficient, independent "actors".

For the sake of simplicity, we have organized their topics in six - interacting and reciprocally empowering Strategic Research Lines:
- Innovative design for architecture, spaces and services: health, education, inclusion, safety and emergency
- Technological and Digital transformation for built environment and construction industry
- Advanced materials and components, clean tech, innovative manufacturing technology for

buildings and built environment
- Risks mitigation strategies for built environment
- History, technology and management of cultural heritage and landscape
- Cooperation, R&D and Technology Transfer for emerging countries (Africa)

More details about the specific research projects to be developed can be found at http://www.abc.polimi.it/it/didattica/dottorato/and https://beep.metid.polimi.it/it/web/abcphd/home

POLITECNICO DI MILANO

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

THEMATIC Research Field: INNOVATIVE TOOLS FOR HERITAGE CONSERVATION WITH HBIM APPROACHES

Monthly net income of PhDscholarship (max 36 months)
€ 1275.0 In case of a change of the welfare rates or of changes of the scholarship minimum amount from the Ministry of University and Reasearch,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 research project aims to prepare the Phd candidate in a complete mode, with the ability to compete for high-level positions in the international field, both as scientific research and as a business world. The candidate, prepared in scientific communication skills, cooperation in research groups also in a competitive environment, will have to demonstrate the ability of critical relationship, sustainable management of problems and attitude to research innovative results in HBIM field. The aim of the research project will be to bridge the gap between BIM for the design of new buildings and HBIM for historical buildings, through: • The development of the different methodologies of Geomatics for the definition of the geometric component of Cultural Heritage; • The best possible integration between analysis of the built form, deformation processes and modifications of objects over time; • The optimization of recognition processes also through automatic machine learning and deep learning processes; and • The integration of the information necessary for the

	conservation, valorization and requalification of the Cultural Heritage For further information see the website www.mantovalab.polimi.it
Methods and techniques that will be developed and used to carry out the research	**Step 1**: The research provides in the first phase the study and evaluation of the state of the art in HBIM methodologies for cultural heritage, preparing the candidate to the research activity through the beginning of the planned courses, and to the activities of the MantovaLAB Laboratory. **Step 2**: In the second phase the definition of innovative tools is expected as an approach to Cultural Heritage in the architectural and archaeological fields, moving from the traditional project to the project on a BIM system platform; in a parallel way the research in national and international field at research centres outside the Politecnico will be investigated in order to complete the training of the scientific method. **Step 3**: In the third phase, will be developed the final thesis summarising the results of the research.
Educational objectives	The objectives set by the research are related to a strategic choice with respect to the direction that the construction sector is currently taking. The use of HBIM will increasingly allow a lot of data and information to be managed in a coordinated way on the 3D model of the existing building, among the different fields of specialist application, in order to optimise resources and time. While the experimentation of HBIM has started, also accomplice to the introduction of the restoration standards UNI, the increasing attention and use of HBIM methodologies by public and private contracting stations is starting to diffuse. For this reason, the proposed PhD research project aims to develop skills in HBIM for the disciplinary field of Geomatics: it is about anticipating the transformations that will occur in the field of technical skills to change the vision of surveying disciplines from "tools" to "integrated systems" in Building

	Information Modeling applied to Cultural Heritage, for the complete digital management of the building process.
Job opportunities	The activities developed by the PhD student will allow him to propose him both in the field of research development for innovative applications in the construction sector and in particular the field of cultural heritage, and in the world of work thanks to high-profile training on specific topics related to the themes of the ABC-PhD programme. These topics will strongly influence the built heritage sector: while on the one hand the practical demands for technology transfer from research are increasing, on the other hand the university will ensure that innovation in the field of HBIM has a solid scientific basis.
Composition of the research group	0 Full Professors 2 Associated Professors 0 Assistant Professors 2 PhD Students
Name of the research directors	Prof. Luigi Fregonese

Contacts
Prof. Luigi Fregonese Email: luigi.fregonese@polimi.it Phone: +39 0376.317056

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	637.5 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Additional support: **Budget for the research activity:** total amount Euro 5,197.62 per student In detail:

- 1st year Euro 1,732.54
- 2nd year Euro 1,732.54
- 3rd year Euro 1,732.54

Additional information on the organization and rules of ABC-PhD programme can be found in the Regulations for the 38th Cycle of ABC-PhD:
download is available at link:
https://beep.metid.polimi.it/web/abcphd/documenti-e-media

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

Additional information on the MantovaLAB - Hesutech Group:
available at link:
WEBsite: www.mantovalab.polimi.it

Desk availability:
The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.