POLITECNICO DI MILANO

# PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 39th cycle

## THEMATIC Research Field: STRUCTURAL HEALTH MONITORING-DRIVEN DECISION MAKING FOR OPTIMAL BRIDGE MANAGEMENT

| Monthly net income of PhDscholarship (max 36 months) |
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| **€ 1400.0**<br>In case of a change of the welfare rates during the three-year period, the amount could be modified. |

| Context of the research activity | |
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| **Motivation and objectives of the research in this field** | The field of bridge management and decision-making has gained increasing significance in recent years due to the critical role that bridges play in the infrastructure of modern societies. Aging infrastructure, coupled with the ever-growing demands on transportation networks, poses significant challenges in maintaining the safety, functionality, and efficiency of bridge structures. The need for sustainable and cost-effective strategies for bridge maintenance and management has never been more pressing.<br>Structural health monitoring (SHM) has emerged as a powerful tool for assessing the condition of bridges in realtime. However, there is a growing gap between the wealth of data provided by SHM systems and the effective utilization of this information for informed decision-making. Bridging this gap is crucial for optimizing resource allocation, enhancing safety, and prolonging the lifespan of bridges.<br>The primary objectives of this research are as follows:<br><br>1. to create advanced decision models that use SHM data to predict and assess the structural health of bridges, enabling proactive maintenance strategies;<br>2. to investigate methods to integrate multi-modal data |

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| | 2. to investigate methods to integrate multi-modal data from various sensing technologies, e.g., sensors for structural health and environmental conditions; and<br>3. to establish a comprehensive risk assessment framework that considers both structural and non-structural factors to prioritize maintenance activities. |
| **Methods and techniques that will be developed and used to carry out the research** | In pursuit of our goals, the research employs the following methods and techniques:<br><br>•**Structural Health Monitoring**: development of techniques for damage identification;<br>•**Probabilistic Modeling**: development of a framework for risk evaluation in bridge management; and<br>•**Decision Theory**: integration of monitoring data to enhance decision-making in bridge management, applying decision theory principles to support decision makers. |
| **Educational objectives** | The Candidate will acquire expertise in structural health monitoring, probabilistic modelling, and decision making. Besides this, it is expected that the candidate will develop a publication record in recognized international journals and conferences and transversal skills related to communication and project management. |
| **Job opportunities** | The candidate will have wide employment possibilities in academia, R&D departments of companies in private or public bodies owning or managing structures and infrastructures (buildings, bridges, pipelines for oil and gas, water, waste-water, etc.).<br>Expertise in the efficient use of structural health monitoring for decision support will make the PhD candidate a first choice for the market related to structural management. |
| **Composition of the research group** | 0 Full Professors<br>1 Associated Professors<br>1 Assistant Professors |

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| | 5 PhD Students |
| **Name of the research directors** | Prof.ssa Maria Giuseppina Limongelli |

| **Contacts** |
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| Prof.ssa Maria Giuseppina Limongelli<br>mariagiuseppina.limongelli@polimi.it |

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

| **Scholarship Increase for a period abroad** | |
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| **Amount monthly** | 700.0 € |
| **By number of months** | 6 |

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

This PhD research will be developed in the context of the **project Horizon Europe SARIL** GA n. 101103978 (progetto LGL3RUEU01). Participation to project's meeting and activities is mandatory, when required.

**Budget for the research activity (only for the position supported by scholarship)**:
total amount Euro 5707.20 per student

In detail:
- 1st year Euro 1902.40
- 2nd year Euro 1902.40
- 3rd year Euro 1902.40

**Additional information about the organization and regulations of ABC-PhD programme can be found in the Regulations for the 39th Cycle of ABC-PhD:** download is available at link: https://www.dottorato.polimi.it/corsi-di-dottorato/architettura/architettura-ingegneria-delle-costruzioni-e-ambiente-costruito

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

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