



PhD in INGEGNERIA STRUTTURALE, SISMICA, GEOTECNICA / STRUCTURAL SEISMIC AND GEOTECHNICAL ENGINEERING - 38th cycle

**PNRR_352 Research Field: LIFE-CYCLE STRUCTURAL SAFETY AND RESIDUAL LIFETIME
OF RC/PC BRIDGES UNDER CORROSION**

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

Context of the research activity	
<p>Motivation and objectives of the research in this field</p>	<p>Learning from disasters and promoting sustainable development of society through effective maintenance and management of structures and infrastructure systems are pillars of the national plan for recovery and resilience (PNRR). In recent years many studies and news raised alarms about the detrimental impact of aging, fatigue, and deterioration processes on structures and infrastructural facilities, particularly bridges. This is a major problem because huge stocks of bridges built over the past 50 years are rapidly approaching the end of the service life. The impact of structural deterioration is particularly high for reinforced concrete (RC) and prestressed concrete (PC) bridges exposed to corrosion. To face this urgent need, the development of life-cycle methodologies for the assessment of corroding RC/PC bridges under uncertainties, supported by data collection, experimental testing, and digitalization in comprehensive models, is a compelling priority.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research program involves the development of a life-cycle probabilistic framework for the assessment of the structural safety and residual lifetime of RC/PC bridges under corrosion considering the uncertainties related to material and geometrical properties, damage processes, mechanical and environmental stressors. The formulations are extended to include the time factor in a</p>



	lifetime scale by modeling the diffusion process of aggressive agents leading to corrosion initiation and damage propagation. Experimental validation and demonstrative cases aimed at ensuring feasible and effective implementation of the proposed approach are essential components of the project. To achieve this goal, the development of life-cycle theoretical methods and implementation procedures is complemented by data and information gathered from experimental tests carried out on RC/PC bridge structural elements extracted from a viaduct dismantled after 50 years of lifetime within a joint project with universities, public authorities and private companies (www.bridge50.org). The potential application of the proposed methods and techniques to pilot bridges to be selected jointly with the industrial partner (TECNE) will be considered based on the co-funding and ongoing research agreements.
Educational objectives	Scientific and technical training of an expert in the field of life-cycle structural assessment of RC/PC bridges, with knowledge and skills required in decision-making for rational prioritization and planning of maintenance, repair, or replacement of deteriorated bridges.
Job opportunities	Public authorities, private companies, managing bodies, and professional firms involved in design, assessment, inspection, diagnostics, monitoring, and/or maintenance of bridges and transportation infrastructures.
Composition of the research group	1 Full Professors 0 Associated Professors 1 Assistant Professors 4 PhD Students
Name of the research directors	Fabio Biondini

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	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	TECNE Autostrade per l'Italia
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	to be defined
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p><u>Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:</u></p> <ul style="list-style-type: none"> • Lehigh University, Bethlehem, PA, USA • Technical University of Catalonia, Barcelona, Spain • Waseda University, Tokyo, Japan • See also: www.bridge50.org <p><u>Educational activities</u> (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): 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.</p> <p><u>Teaching assistanship</u> (availability of funding in recognition of support to teaching activities by the PhD student): Ph.D. students are encouraged to apply, upon prior authorization, to the calls to support teaching activities at the undergraduate and Master levels at Politecnico, being paid for that. The teaching assistantship will be limited up to about 80 hours, maximum half of them devoted to teaching and classroom activities and the rest to support classworks and exams.</p> <p><u>Computer availability and desk availability:</u> Each Ph.D. student has his/her own computer for individual use. Each Ph.D. student has his/her own desk, cabinet and locker.</p>