



PhD in CHIMICA INDUSTRIALE E INGEGNERIA

CHIMICA / INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING - 38th cycle

PARTENARIATO PNRR Research Field: ENGINEERING, PROCUREMENT, CONSTRUCTION, AND OPERATIONS OF MINIPANT FOR INNOVATIVE TECHNOLOGY VALIDATION

Monthly net income of PhDscholarship (max 36 months)
€ 1325.0
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	ECS-MUSA ECOSISTEMA DELL'INNOVAZIONE MUSA - MULTILAYERED URBAN SUSTAINABILITY ACTION CUP: D43C22001410007 (D.D. 1055 del 23/06/2022)
	<p>As a chemical engineer the candidate is expected to help in the upscaling and development of laboratory-scale chemical systems into demo-scale chemical processes. The focus of the activity will be in overcoming the challenges of greater capacity systems allowing small scale laboratory conceptual designs researched at Politecnico di Milano to reach demo-scale prototypes. This can make the technology appealing for industrial contractors that can then take over development to reach full industrial and commercial development. In particular, in recent years, thanks to the activity of the Technology Transfer Office, the Politecnico has provided researchers and students with specific tools and support for the economical exploitation of scientific results, through the protection of Intellectual Property, the licensing of patents, and the creation of spin-off companies. However, the technological maturation of very promising ideas, is unavoidably undermined by the university's reduced financial capability and limited industrial outreach. Industrial level pilot plants are needed to carry out the validations required by companies. The PhD project will aim to reinforce the core activities of</p>



	<p>the TTO by improving the screening of technology transfer opportunities in the chemical engineering sector and support the realisation of an innovative infrastructure to upscaling the most relevant research projects. This infrastructure is aimed at designing, building and operating special mini pilot plants that will allow technologies to move from a TRL 1 to TRL 4. Given the above points the intended objective of the project and main task of the candidates will thus be to rise the TRL of technologies designed at Politecnico di Milano or in collaboration with industrial partners to a TRL ranging from 5 to 7 depending on the specific application. The specific technology to be upscaled by the candidate will be a biogas to methanol process with a focus on an innovative tri-reformer reactor to better value the CO₂ content of biogas and improve environmental and economic performance of small scale reforming to methanol.</p> <p>Regarding the areas of intervention of the National Recovery and Resilience Plan (PNRR), the project proposal meets the programmatic directions of some of the main horizontal pillars of the PNRR-Next Generation Italy, and in particular the issue of "Deep Tech: Entrepreneurship & Technology Transfer" in the MUSA project (Multilayered Urban Sustainability Action).</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research shall be conducted as a sequence of descriptive and prescriptive studies that could be adapted based on the specific gaps and findings that will emerge along the development of the activities. The research project is divided into the following milestones: 1) Extensive review of state-of-the-art competing technologies and relevant scientific and intellectual property work to the technology 2) Development of phenomenological and statistical models relevant to the specific technology 3) Detailed process and mechanical design of the unit operations 4) Construction of a first demo-scale prototype of the unit/process 5) Operations management and real-time optimization. During all these steps the Ph.D. candidate will work closely in collaboration with both the Technology Transfer Manager and the DCMC research groups. The research project is</p>



	divided into the following milestones per years: · First year: basic engineering design package · Second year: miniplant assembled and tested Third year: operations, validation and technology optimization
Educational objectives	The educational objective of the research is to train the candidate to contextualize technical knowledge in the Intellectual Property legal framework. In turn, this involves the development of skills in system modelling, functional modelling, information extraction from structured documents, pattern recognition in innovation dynamics, trend analysis and trend extrapolation.
Job opportunities	Job and career opportunities include professional outlets in all sectors, both public and private, related to technology transfer, business development, and R&D. For example: Technology Transfer Manager, Business Development Engineer, Process & Technology Transfer Engineer, R&D Engineer, Process Engineer, Process Systems Engineering. The PhD experience also prepares for a research career in academia or research centers.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 0 PhD Students
Name of the research directors	Prof. Flavio Manenti

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	662.5 €
By number of months	6

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

D.D. 3277 del 30/12/2021 Avviso pubblico per la presentazione di Proposte di intervento per la creazione di 12 Ecosistemi dell'innovazione sul territorio nazionale da finanziare nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 Componente 2 Investimento 1.5 - Creazione e rafforzamento di "ecosistemi dell'innovazione", costruzione di "leader territoriali di R&S2 - finanziato dall'Unione europea - NextGenerationEU.

The candidate will have to fill in a mandatory questionnaire in order to close the application

Individual budget for research (during the 3 years): about 5.400 euro

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

Study period abroad: yes

Internship in a public administration: no

Desk availability: yes