



# PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 40th cycle

**THEMATIC Research Field: SINGLE AND MULTI-PHASE THERMO-FLUID DYNAMIC ANALYSIS OF INDUSTRIAL SYSTEMS: NUMERICAL INSIGHTS AND ADVANCES**

<b>Monthly net income of PhDscholarship (max 36 months)</b>
<b>€ 1500.0</b>
In case of a change of the welfare rates during the three-year period, the amount could be modified.

<b>Context of the research activity</b>	
<b>Motivation and objectives of the research in this field</b>	<p>The industrial sector is continually evolving, driven by the need for increased efficiency, reliability, and sustainability in its processes and components. Single and two-phase flows are at the heart of numerous industrial applications, ranging from power generation to chemical processing. Numerical simulations play an essential role in advancing our understanding of such industrial processes. By employing computational models, we can address the complexity of these systems under diverse operational scenarios, thereby enhancing efficiency, reliability, and sustainability without directly manipulating physical components. This approach allows for a comprehensive analysis of system performance and safety, which has direct implications on cost-effectiveness and environmental impacts. Through numerical simulations, we aim to fill the existing knowledge gaps in these systems' behavior under varying conditions, thereby contributing to more informed decision-making in industrial applications. Objectives of the research are:</p> <ul style="list-style-type: none"> <li>• <b>To conduct a comprehensive numerical investigation</b> of single and two-phase industrial components and outdoor environments, enhancing the understanding of their behavior and performance under different operational scenarios.</li> <li>• <b>To develop predictive, correlation-based models</b> that</li> </ul>



	<p>accurately describe the thermal-hydraulic phenomena observed in single and two-phase systems.</p> <ul style="list-style-type: none"> <li>•<b>To explore potential design modifications</b> that could lead to improved efficiency and reduced environmental impact.</li> <li>•<b>To disseminate the findings</b> broadly to the industrial, society and academic communities, fostering the adoption of best practices and informing future research directions.</li> </ul>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>This Ph.D. project aims at developing novel simulation methodologies and data processing techniques to derive accurate correlations from simulation data to predict system behavior under various conditions. The expected tools to be used during the research are:<b>Theoretical tools:</b> Thermodynamics, Fluid Mechanics, Statistical analysis, Numerical simulations, Machine Learning, ...  <b>Computational tools:</b> Matlab, Python, ANSYS Fluent, Open FOAM, Blender...</p>
<p><b>Educational objectives</b></p>	<p>Promoting interdisciplinary collaboration, developing critical thinking, and advancing research skills</p>
<p><b>Job opportunities</b></p>	<p>Job opportunities for a successful Ph.D. candidate include both industrial and academical research or specific job positions as Thermal-Fluid Engineer specialized in numerical simulations.</p>
<p><b>Composition of the research group</b></p>	<p>2 Full Professors                  3 Associated Professors                  3 Assistant Professors                  8 PhD Students</p>
<p><b>Name of the research directors</b></p>	<p>riccardo mereu</p>

Contacts
<p>riccardo.mereu@polimi.it</p>

<p><b>Additional support - Financial aid per PhD student per year (gross amount)</b></p>
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Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>No additional support provided.</p> <p><b>Increase in the scholarship for stays abroad: euro 750.00 per month (gross), for up to 6 months. <i>Educational activities:</i></b> Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentations and computer, etc. This amount is equal to 10% of the annual gross amount, for 3 years.</p> <p><b><i>Teaching assistantship:</i></b> Availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid 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 regulations. <i>Computer availability:</i> individual use. <i>Desk availability:</i> individual use.</p> <p><b><i>Awards:</i></b> Awards will be recognized to the PhD candidate up to Euro 2.000,00 (gross amount) per year, in case of exceptional achievements in the research project (modelling tools, scientificpapers, etc..), subject to the evaluation of the research director.</p>