

Open Early Stage Researcher/PhD Position at Dipartimento di Matematica, Politecnico di Milano, Italy, as part of

European Innovative Training Network

**Reduced Order Modelling, Simulation and Optimization of Coupled systems
(ROMSOC)**

ROMSOC is a European Industrial Doctorate (EID) project in the programme Innovative Training Networks (ITN) and part of Marie Skłodowska Curie Actions within the Horizon 2020 programme. The ROMSOC EID Network brings together 15 international academic institutions and 11 industry partners and supports the recruitment of eleven Early Stage Researchers (ESRs). Each ESR will be working on an individual research project in the host institution with secondments related to their research in other academic and industrial partners of the network. The research is focused on three major topics: coupling methods, model reduction methods, and optimization methods, for industrial applications in well selected areas, such as optical and electronic systems, economic processes, and materials. The ROMSOC EID Network offers a unique research environment, where leading academics and innovative industries will integrate ESRs into their research teams for the training period, providing an excellent structured training programme in modelling, simulation and optimization of whole products and processes.

We seek excellent open-minded and team-spirited PhD candidates who will get unique international, interdisciplinary and inter-sectoral training in scientific and transferable skills by distinguished leaders from academia and industry. Within the ROMSOC network we offer the following PhD position at Dipartimento di Matematica, Politecnico di Milano:

Numerical simulations and reduced models of the fluid-structure interaction arising in blood pumps based on wave membranes.

Reference number: ROMSOC-ESR09

Blood pumps are used to assist the ventricles when end-stage heart failure occurs. Pulsatile pumps are rarely used due to the high inertia of their rotors and low frequency pulsation, not like the native heart. This motivates the development of new pulsatile pumps that able to replace the high speed and shear impeller of current continuous flow rotary pumps. The result is much less trauma to the blood, reducing clotting and bleeding complications.

Aim of this ESR is to implement in the Finite Element academic software LIFEV (www.lifev.org) a computational methodology to solve the fluid-structure interaction arising between the pulsatile membrane and the blood. The optimization of the pump with respect to many possible scenarios and to better design the pump in view of some clinical objective will be addressed. A challenging issue will be the modeling and simulation of the contact occurring between the membrane and the external support of the pump. Finally, the implementation of reduced models based on simplified fluid and/or structure models leading to efficient numerical schemes will be studied.

The PhD candidate will spend secondments (50% of the time) for technical and scientific training at Corwave (Paris, France). The PhD degree will be awarded by Dipartimento di Matematica, Politecnico di Milano (Polimi).

Requirements:

- Master degree (or equivalent) in Mathematics, Mathematical Engineering, Biomedical Engineering, Scientific Computing or other related disciplines.
- Experience in numerical solution of differential equations and, possibly, in fluid-structure interaction, model order reduction.
- Experience in modeling biological systems.
- Programming skills in object oriented languages as well as Python/Matlab.
- Strong interest in interdisciplinary scientific work.
- Ability to work independently and as part of a team.

- Strong motivation to pursue a PhD degree.
- Preferred qualifications include excellent grades, research talent (as proven by the master thesis), affinity with mathematical modeling and simulation in engineering applications, and personal ambition.
- Excellent command of English, together with good academic writing and presentation skills.

Starting Date:	1st of March 2018
Contract:	Full-time contract for 36 month
Host institution:	Dipartimento di Matematica, Politecnico di Milano, Milan, Italy
Salary:	The Marie Skłodowska-Curie programme offers highly competitive and attractive salaries. Gross and net amounts are subject to country-specific deductions as well as individual factors and will be confirmed upon appointment.
Information/Contact:	Prof. Eng. Christian Vergara (Primary Supervisor) Email: christian.vergara@polimi.it
Application:	Applications (motivation letter, detailed CV, certificates, list of MSc courses and grades, copy of the master thesis, reference letter etc) with indication of the position reference number should be send to christian.vergara@polimi.it Applicants that apply for more than one individual research project should indicate the order of preference (e.g. 1st, 2nd and 3rd choice).
DEADLINE	30.11.2017

To ensure the equality of opportunities we strongly encourage women with the appropriate qualifications to apply. If equally qualified, handicapped applicants will be preferred.

Eligibility: *The candidate recruited in the ROMSOC project must be in the first four years from the date when the candidate obtained the degree entitling him or her to embark on a doctorate (e.g. master degree). No doctoral degree has been awarded during these four years. The candidate must not have resided or carried out her/his main activity (work, studies, etc.) in Italy for more than 12 months in the 3 years immediately prior to the recruitment date. Compulsory national service, short stays such as holidays, and time spent as part of a procedure for obtaining refugee status under the Geneva Convention are not taken into account. The candidate must work exclusively for the project during the employment contract. The candidate must fulfill the conditions to be admitted in the PhD programme indicated in the job vacancy. Tuition fees will be covered by the fellowship. These conditions must be fulfilled at the starting date of the contract. The starting date for each position is tentative.*