POLITECNICO DI MILANO

PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 41st cycle

Research Area n. 2 - Electronics

THEMATIC Research Field: INTEGRATED SENSOR SYSTEMS FOR THE ELECTRICAL DETECTION OF BIOMARKERS

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	
Motivation and objectives of the research in this field	The research aims to develop innovative microelectronic integrated platforms for the selective detection of biomolecules in liquid. In particular, the research targets new active electrochemical sensors in C-MOS technology based on floating-gate transistors (isFET), characterize their performances in the presence of chemical and biological targets (DNA / RNA) and propose effective industrial solutions. The scientific challenge lies in the extremely high sensitivity required by the electronic system to detect the single molecule, i.e. to detect infection at the earliest possible stage of the disease, thus maximizing the clinical benefits of early diagnosis.
Methods and techniques that will be developed and used to carry out the research	1) Design of sensors for pH analysis and for biomarkers detection and of the reading electronics based on STm CMOS technology; 2) experimental validation of the sensors in laboratory and their evolution toward industrial feasibility; 3) development of an electronic system for real-time acquisition and analysis of the data.
Educational objectives	The PhD candidate will develop a strong background in bio-electronic systems, with specific skills in the design of low-noise microelectronic circuits and in the development of FPGA-based real-time digital systems. It is expected that he/she will acquire a strong attitude in conducting an

	independent research project, from the conception of the nanoscopic bio-electronic interface to the design of the full system, the experimental validation and the dissemination of results.
Job opportunities	The broad applicability of the skills acquired during this research project will open career opportunities in the big international companies of semiconductor circuits as well as in companies more specifically oriented to the R&D of innovative bioelectronic systems. Moreover, the skills in developing an entire bio-electronic instrument also offer working opportunities in innovative startups and in many small and middle enterprises.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 1 PhD Students
Name of the research directors	Prof. Marco Sampietro, Marco Bianchessi (STm)

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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

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

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences). TEACHING ASSISTANTSHIP: 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.

COMPUTER AVAILABILITY:
1st year: Yes
2nd year: Yes
3rd year: Yes

DESK AVAILABILITY:
1st year: Yes
2nd year: Yes
3rd year: Yes