Annex A – Positions with specific topic

Ph.D. Course	**NEUROSCIENCES**
Scholarship type	MISSIONE 4 – ISTRUZIONE E RICERCA Investimento 4.1 - Dottorati di ricerca PNRR (art. 8, DM 118/2023)
N.	2
CUP	E53C23001290001
Title	**Advanced Neurotechnologies**
Brief description of the research project	Neurosciences are moving towards the integration between: i) molecular technologies capable of revealing changes at the level of a single cell, or of cellular subcompartments (for example pre- or post-synaptic); ii) functional analysis methodologies capable of monitoring the activity of many neurons simultaneously and performing stimulation of selected neuronal populations; iii) Artificial Intelligence technologies. The PhD course will allow students to acquire teaching and training experiences in the field of such advanced neurotechnologies for the study of neural activity and plasticity, in physiology and pathology, and for integration with neuroprostheses. To this end, we will study the basic mechanisms of learning and brain responses to innate or acquired pathological conditions through imaging and electrophysiology methods and we will use methods for the generation of experience-dependent synaptic remodeling molecular sensors." Furthermore, the PhD course will allow to carry out research and to sign in the field of biological neural networks ("Biological neural networks"). The use of (artificial) neural networks in their various forms has produced exponential growth in recent years of Artificial Intelligence applications.However, our understanding of the functioning and potential of biological neural networks is currently very poor, due to the lack of effective methods for their interfacing with the experimenter.The recent development of sophisticated interface platforms with thousands of electrodes for the recording and stimulation of neuron cultures and organotypic preparations of brain regions allows the functional study of biological neural networks. The PhD course will allow students to acquire teaching and training experiences on such networks for the study of neural activity and plasticity, in physiology and pathology. To this end, the basic mechanisms of modification and learning of biological networks will be studied using a 4096-electrode platform recently acquired by the School."
SSD	BIO/09
Period of study and research to be carried out abroad	It is mandatory to carry out periods of study and research in companies or research centers from a minimum of six (6) months to a maximum of twelve (12) months, even if not continuous, and periods of study and research abroad. The destinations for each student will be decided by supervisors and the Ph.D course board.