



# Sapienza PhD in ICT

Doctoral program in Information and Communications Technologies at Sapienza Università di Roma, Rome, Italy

## First Year Doctoral Program Form

<b>LAST NAME</b>	<b>Filippini</b>
<b>NAME</b>	<b>Francesca</b>
<b>CURRICULUM</b>	<b>Radar and Remote Sensing</b>
<b>DOCTORAL CYCLE</b>	<b>XXXII</b>

The Doctoral Program Form contains, year by year, the description of the PhD program of each Doctoral student. This form must be submitted to the PhD coordinator with roughly the following timing:

- by the end of February of the first year for first year students
- before the admission to the second year by perspective second year students
- before the admission to the third year by perspective third year students

The Doctoral Program Proposal is approved by the PhD board shortly after submission. The Doctoral Program requirements place formalized emphasis on methodology and mastery of fundamental and applied engineering systems concepts. A Doctoral Program Proposal should be constructed in agreement with the Faculty mentor, that is the supervisor or tutor, by complying to the requirements, described in the Tables below.

<b>ADVANCED COURSES: 12 CREDIT FORMATION UNITS (CFU)<sup>1</sup></b>				
Only courses/schools providing a final verification test with pass/fail outcome certified by instructor can be included here.				
<b>Title</b>	<b>Type</b>	<b>Duration / period</b>	<b>CFU<sup>2</sup></b>	<b>Motivation for selection</b>
<b>Elaborazione delle Immagini Radar</b>  (D. Pastina)	Master Degree Course	26/09/2016 - 21/12/2016  (60 hours)	6	This course will enrich my knowledge of one of the most important application of radar technology. The principles of the Synthetic Aperture Radar (SAR) are introduced, together with their focusing methodologies. The signal processing techniques for autofocusing the SAR images and their corrections are described in details.
<b>Project Management "PRINCE2 Foundation"</b>	PhD Course	19-21/06/17	6	This course will focus on the international Project Management "PRINCE2 Foundation". It will be very useful because it teaches interesting notions about the methodologies used in a project.  Furthermore, it will lead to the acquisition of an international certification.
<b>Total CFU</b>			12	

<sup>1</sup> Please insert lines as required/appropriate, and for each line complete each column of the Table.

<sup>2</sup> Indicate here the CFUs that can be accounted for as a result of the successful completion of the activity; for Master Degree courses, assume 1 CFU = 8 teaching hours + 12 homework/study hours, for a total of 20 hours. This rule can be slightly adjusted for other types of courses/activities (e.g., PhD courses may require slightly less hours per CFU)

<b>SEMINARS AND LABORATORY ACTIVITIES: 6 CFU<sup>3</sup></b>				
<b>Activity</b>	<b>Type</b>	<b>Duration / period</b>	<b>CFU<sup>4</sup></b>	<b>Motivation for selection</b>
<b>Scrittura tecnico - scientifica</b> (E. Matricciani)	Short Course	January / February 2017 24 hours	4	The course aims at providing fundamental elements of the technical and scientific writing. I chose this seminar since it gives a good background for producing clear and solid technical documents. I reckon that these skills are a key factor in a PhD, since a scientific publication marks the endpoint of a research that has been performed, completed, peer reviewed and accepted.
<b>Biologically Inspired Radars: Lessons from Nature</b> (Alessio Balleri)	PhD Seminar	17/02/2017	1/3	This PhD seminar will focus on bio-inspired sensing and will place some emphasis on similarities with radar micro-Doppler techniques. In fact, nature presents examples of active sensing which are unique, sophisticated and incredibly fascinating. There are animals, such as the bat, that sense the environment actively through echolocation calls and that have evolved their capabilities over millions of years. As a result of evolution, bats have developed unique in-built sensing mechanisms to carry out many different tasks which include navigation, collision avoidance, detection, selection and identification of prey. There may be lessons that can be learnt from looking at how nature operates and at the solutions, that evolution has provided.
<b>Experimental Campaigns and Laboratory activities</b>			2	The experimental validation of the theoretical analysis and the effectiveness of the signal processing techniques is a precious part of my research activities. Different experimental campaigns have been (or are planned to be) carried out together with the needed hardware set-up.
<b>Future ICT Seminars delivered by the DIET</b>			1	Seminars are very effective to increase the knowledge on a specific topic. I will choose the ones that will be delivered in the following months.
<b>Total CFU</b>			<b>&gt;6</b>	

<sup>3</sup> Please insert lines as required/appropriate, and for each line complete each column of the Table.

<sup>4</sup> Indicate here the CFUs that can be accounted for as a result of the successful completion of the activity; as a rule of thumb, assume 1 CFU = 20 working hours.


<b>ADDITIONAL INDEPENDENT FORMATION AND RESEARCH ACTIVITIES: 6 CFU<sup>5</sup></b> Indicate activities that extend and complement the mandatory activities listed above				
<b>Activity</b>	<b>Type</b>	<b>Duration / period</b>	<b>CFU<sup>6</sup></b>	<b>Motivation for selection</b>
<b>9th International Summer School on Radar / SAR</b>  (Bonn, Germany)	Summer School	14-21 July 2017	>5	The main focus of the 9th International Summer School on Radar/SAR lies in particular in imparting the knowledge of the physical fundamentals and technologies of modern Radar/SAR systems and the necessary signal processing steps. Special emphasis is put on imaging radar. Considered systems and applications are regarded within civilian range and in the defense. The International Summer School on Radar/SAR will consist of a series of lectures given by recognized experts on the above topics and related fields of application. Therefore, this summer school can give me the possibility to improve my knowledge on radar and synthetic aperture radar (SAR) systems and techniques. Moreover, in this frame I will also have the possibility to meet and compare my experience with PhD students from other countries.  ( <a href="http://www.radarsummerschool.fraunhofer.de/summerschool/">http://www.radarsummerschool.fraunhofer.de/summerschool/</a> )
<b>Total CFU</b>			>5	

<b>RESEARCH ACTIVITY: 36 CFU</b>	
<b>Research area</b>	Radar and Remote Sensing: Advanced Signal Processing Techniques and Methodologies for Passive Radar Systems
<b>Research topic</b>	The core of the research is the development of advanced signal processing techniques for passive radar (PR) systems. Specifically, two key points have been identified : (i) The definition of advanced processing techniques to improve the performance of a PR, especially in terms of reliability.  (ii) The development of processing techniques and operational strategies, which aim at the extraction of additional and/or more accurate information on the detected targets.

<sup>5</sup> Please insert lines as required/appropriate, and for each line complete each column of the Table.

<sup>6</sup> Indicate here the CFUs that can be accounted for as a result of the successful completion of the activity; as a rule of thumb, assume 1 CFU = 20 working hours.

<p><b>Framework of the proposed research topic</b></p>	<p>The main activities to be carried out during the first year of my PhD will focus on the first point (i) of the previous Section. They are briefly summarized in the following:</p> <ol style="list-style-type: none"> <li>1) The first step is the identification and evaluation of the key literature. In fact, a preliminary literature review will be necessary in order to focus the research problem and to build a solid knowledge.</li> <li>2) With the aim of improving the performance and enhancing the reliability of passive radar system, the first step will be the development of alternative methods to those found in the literature. Those will mainly exploit a diversity of information obtained in one or more domains. Specifically, the different possibilities that I will consider are             <ol style="list-style-type: none"> <li>a. Polarization diversity</li> <li>b. Frequency diversity</li> <li>c. Spatial diversity.</li> </ol> </li> <li>3) Along with extensive theoretical evaluations of the proposed approaches, the experimental validation will be a key step, in order to examine how the derived approaches perform. For this purpose, some <i>ad hoc</i> experimental campaigns are expected to be carried out.</li> </ol>
<p><b>Research environment</b></p>	<p>The main activities will take place within the RRSN (Radar Remote Sensing and Navigation) research group at DIET Department. However, part of the activities will be carried out in collaboration with some research groups and institutions that excel in the same research topic. A partnership with the research institute Fraunhofer FHR of Wachtberg (Bonn, Germany) has already started and we will consider the possibility of spending some short periods within their institution, in order to finalize the results of the collaboration.</p>

<p><b>FACULTY MENTOR (TUTOR OR SUPERVISOR)</b></p>	
<p><b>Prof. Dr.</b></p>	<p>Fabiola Colone</p>
<p>Supervisor signature for approval</p>	

Signature of Doctoral student

*Francesco Tufli*

Date

03/03/2017