



Sapienza PhD in ICT

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

First Year Doctoral Program Form

LAST NAME	Murgia
NAME	Federica
CURRICULUM	Applied Electromagnetics
DOCTORAL CYCLE	XXXII

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.

ADVANCED COURSES: 12 CREDIT FORMATION UNITS (CFU)¹

Only courses/schools providing a final verification test with pass/fail outcome certified by instructor can be included here.

Title	Type	Duration / period	CFU²	Motivation for selection
International Project Management Course ("PRINCE2® Foundation")	PhD Course	19-20-21/06/2017	6	This course aims at introducing the most popular method of project management at a European level. I chose this course to enrich my formation with some economical basis, and to be able to work in a better way in all the projects in which I am going to be involved.
Telerilevamento a Microonde	Master Degree Course	20/02/2017 – 26/05/2017	6	This course aims at describing the principles and the applications of active and passive sensors for remote sensing operating in the microwave region of the electromagnetic spectrum. It illustrates the physical bases, and the electromagnetic models to describe the emission, absorption and scattering properties of the radiation by natural media (atmosphere, sea, land). I chose this course to deepen my knowledge on the methods used to retrieve the geophysical and electromagnetic parameters of complex media like atmosphere and land subsurface.

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

² 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)

Total CFU	12	
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SEMINARS AND LABORATORY ACTIVITIES: 6 CFU³				
Activity	Type	Duration / period	CFU⁴	Motivation for selection
Corso di Scrittura Tecnico-scientifica	seminar	24 hours total 24-25/01/17 and 07-08/02/17	4	This course provides the fundamental elements to write a scientific paper. I chose this course to learn how to write a scientific paper properly.
Sentinel-1 Processing with GAMMA and SARCscape software	Laboratory (carried out at INGV)	From December 2016 to June 2017	>2	This activity aims at providing advanced skills on the generation of interferograms, using data from the Scientific Hub provided by ESA. This practical activity is going to give me a complete overview on the processing steps of SAR images.
Total CFU			>6	

ADDITIONAL INDEPENDENT FORMATION AND RESEARCH ACTIVITIES: 6 CFU⁵ Indicate activities that extend and complement the mandatory activities listed above				
Activity	Type	Duration / period	CFU⁶	Motivation for selection
4th Advanced Course on Radar Polarimetry http://seom.esa.int/polarimetrycourse2017/	Course	30/01/2017 – 02/02/2017	6	The Advanced Course on Radar Polarimetry is devoted to train how to exploit dual and fully polarimetric data for science and application development. It consists of a series of lectures and practical activities with PolSARPro software given by experts on the above-mentioned topics. I chose this course to learn how to translate in practical applications all the theoretical knowledge acquired during my Master Degree years.
Advanced Antenna Engineering	Master Degree Course	21/02/2017 – 26/05/2017	6	This course is important to enlarge the knowledge of the different antenna systems. The course aims at presenting a variety of topics in Antenna Engineering, including modeling, design, and numerical aspects as well as a selection of CAD tools. I chose this course to enrich my knowledge on antenna systems and to learn how to select and use the proper CAD tool to analyze different types of radiating structures.
Total CFU			6	

RESEARCH ACTIVITY: 36 CFU

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

⁴ 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.

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

⁶ 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.

Research area	Applied Electromagnetics: Electromagnetic propagation modeling in complex media and data processing for geophysical applications of radar interferometry and tomographic reconstruction techniques.
Research topic	<p>The main aim of my research activity is the development of models able to exhaustively describe all the mechanism that can take place in complex media (i.e. Atmosphere and subsurface soil), through:</p> <ul style="list-style-type: none"> • Analysis of D-InSAR (Differential SAR Interferometry) products • Analysis and accurate imaging techniques of GPR (Ground Penetrating Radar) products. <p>In particular, the main goal of the first topic is to retrieve an accurate model of the atmosphere in order to isolate the tropospheric contribution to the SAR interferogram (the Atmospheric Phase Screen) and to use the related information to generate maps of temporal variations of the Precipitable Water Vapor (PWR) spatial distribution and to increase the quantitative precipitation forecasting.</p> <p>The main goal of the second topic is related to the development of a GPR system, together with the definition of the proper processing techniques, able to generate a tomographic image useful to retrieve all the electromagnetic and geophysical properties of the domain investigated.</p>
Framework of the proposed research topic	<p>The main activities to be carried out during the first year of my PhD are briefly summarized in the following.</p> <ul style="list-style-type: none"> • Literature review to build a solid knowledge in GPR systems as well as satellite sensors and interferometry technique • Exploitation of interferometric data from Sentinel 1 satellites, GPS data from ground-based station located in proximity of the region of interest and numerical weather prediction (NWP) models • Exploitation of data retrieved from GPR sensors to obtain a tomographic reconstruction of the investigated media

<p>Research environment</p>	<p>The main activities will take place at DIET Department of University of Rome "La Sapienza".</p> <p>However, as regards the first topic a cooperation is expected with the INGV (Istituto Nazionale di Geofisica e Vulcanologia), located in Via di Vigna Murata 605, Rome.</p> <p>As regards the second topic cooperation is expected with Roma3 University, with the research group supervised by Prof. Elena Pettinelli.</p>
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FACULTY MENTOR (TUTOR OR SUPERVISOR)	
<p>Prof. Dr.</p>	<p>Alessandro Galli</p>
<p>Supervisor signature for approval</p>	

Signature of Doctoral student

Date
21/03/2017

