Operational Program European Social Fund - Regione Liguria 2014-2020
ASSE 3 "Education and training"

UNIVERSITÀ DEGLI STUDI
DI GENOVA

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EXCERPT OF INFORMATION SHEET **SCIENCE AND TECHONOLOGY FOR ELECTRICAL ENGINEERING, MARINE ENGINEERING, COMPLEX SYSTEMS FOR MOBILITY**	
GENERAL INFORMATION	
STRUCTURE OF THE TRAINING PROJECT	
DURATION AND ORGANIZATION OF THE COURSE	The course starts officially on 1 of November 2018 and lasts three years. At the end of each year, doctoral students shall present the Teaching Body with a detailed written account of the activities carried out. The Teaching Body may ask for the account to be discussed according to procedures it has established. **Coordinator of the course:** Prof. Mario Marchesoni **E-mail address:** marchesoni@unige.it **Department coordinating for research:** Department of Marine, Electrical, Electronic and Telecommunications Engineering (Dipartimento di Ingegneria navale, elettrica, elettronica e delle telecomunicazioni – DITEN)
TRAINING PROJECT	The following 3 projects/scholarships are activated: **Curriculum: ELECTRICAL ENGINEERING (CODICE 7310)** **Project/scholarship No. 1: Planning, design and management of microgrids for effective interaction with intelligent electric networks** *Months abroad: 6.* *In cooperation with:* • Laboratorio IEES (Intelligent Electric Energy Systems) - DITEN (Università di Genova) • PETRA (Power Electronics, Transportation and Automation) - DITEN (Università di Genova) • Softeco Sismat Srl • IESolutions® • Université de Liège, Belgio sede di un soggiorno all'estero fino a sei mesi • Polo Energia Ambiente Sviluppo Sostenibile (EASS) *Project/scholarship details:* This is a scholarship for an innovative PhD in the Energy and Automation sectors, characterized by an industrial support from Softeco Sismat and IESolutions located in Genova (Members of EASS – Innovation Group for

Energy, Environment and Sustainable Development). The subjects of this PhD are well related with the National Research Program 2015-2020 – Specialistic Area Energy and with the goals of "Industry 4.0" for the Energy and Industrial Processes.

The research activity is within the smartgrid and intelligent microgrid scenarios. It will propose the architecture of a centralized Management System for Microgrids (small electric networks operating in interconnected and in isolated modes). This system will be able to manage optimization and control problems, to supply ancillary services from renewable generation and loads. Possible emergency situations and consequent restoration procedures will be also considered. Innovative communication and protection systems will be studied and proposed.

Finally, the setup of models for Microgrids with distributed generation and their validation on an electric network simulator and on experimental sites made available by Partners, will be operated.

The research topics belong to the sectors of the Electrical Systems for the Energy and of the Converters, Electrical Machines and Drives, that are strongly interdisciplinary and concern aspects of energy, mechanics, electronics and all ICT sectors. They involve scientific competences regarding the plant engineering of the electric systems, system theory, automatic controls, power electronics and Information Technology.

The project will be developed in three coordinated phases. For the whole duration of the project, results dissemination actions will be conducted, also taking advantage of the contacts of the Operational Units of the DITEN with the IEEE Italy Power and Energy Branch Institutions and with the AEE – the AEIT Electric Energy Society.

During the 3-year period, a six months long exchange will take place at the Faculty of Applied Sciences - Department of Electrical Engineering and Computer Science (Montefiore Institute) of the University of Liège (Belgium).

Moreover, a six to nine months long stage will take place at the Companies involved in the project. The Companies will be involved in the objectives definition phase, in the training and in the use of the software and hardware tools made available by the Companies themselves.

Curriculum MARINE ENGINEERING (CODICE 7311)

Project/scholarship No. 2: Advanced technologies for the analysis of ship-in-service data gained with innovative inspection methods.

Months abroad: 6.

In cooperation with:
- Unità Operativa Ingegneria Navale del DITEN
- RINA Services S.p.A.
- Cranfield University, Regno Unito
- Distretto Ligure delle Tecnologie Marine (DLTM)

Project/scholarship details:
The growing interest for digital technologies in the shipping field pushes towards the development of specific knowledge about the relevant enabling know-hows.

In the frame of the present PhD project, generation, acquisition, analysis and usage of big data sets for ships and their management are planned to be studied.

The education path includes a familiarization phase with the most innovative methods for the acquisition and management of large quantities of data, a development phase developing cutting-edge techniques for the data analysis and an application phase to account for the specific needs of the shipping and shipbuilding sectors, properly considering type, quality and quantity of available data as well as their potential usage to create new, cost-effective and safety-improving services, covering typical test cases.

In particular, after a first year mainly devoted to training on research practice and to acquisition of the specific skills not attained during MSc courses, the

second year will be spent to analyze current survey and inspection processes, highlighting their pros and cons as well as their rule requirements. The third year will be devoted to the synthesis of the studied processes and to the technology transfer to the shipping field of the lessons learnt in the first two years: the PhD student will study and will apply to actual test cases the analysis methods, elaborating information gained with advanced inspection methods. Furthermore, a Value of Information (VoI) study will be carried out based on the approaches proposed by this novel scientific discipline.

In the first year, the PhD will be mainly at university while RINA will support the identification of the training courses and of the education path suitable for the research project. In the second part of the PhD, the acquired approaches will be applied in the specific industrial sector and namely to the condition and performance assessment of ships. The activity will be partly in industry and partly at university. Short trips (in Italy or abroad) are foreseen in order to visit ships, repair shipyards, workshops and/or companies producing systems and equipment for inspections.

The PhD student will spend 30 months in Genova (partly at RINA or other companies and partly at the university, depending on the needs) and 6 months abroad in organizations dealing with the project issues.

The candidate is a MSc graduate in scientific disciplines, with preference for engineering MSc and namely MSc in naval architecture and marine engineering. However, since this PhD deals with naval architecture as well as with electronic engineering, knowledge in at least one of the two fields is enviable.

Project/scholarship No. 3: Enabling technologies and decision support systems towards autonomous navigation of ships.

Months abroad: 6.

In cooperation with:
- Unità Operativa Tecnologie e Impianti Navali (Marine Technology) del DITEN
- UNIGE
- SEASTEMA S.p.A.
- Delft University of Technology, Olanda
- Distretto Ligure delle Tecnologie Marine (DLTM)

Dettaglio Progetto/borsa:
The proposed Ph.D. grant aims to study and develop an integrated system of guidance and automatic control of position, course, and speed of a ship.

During the Ph.D. program, the candidate will work for 27 months in Genoa University, for 3 months in Seastema S.p.a, and for 6 months at the Technische Universiteit Delft (Netherland).

Referring to the state of the art concerning the guidance system, the candidate will develop new algorithms for the detection and avoidance of both fixed and mobile obstacles, with traditional techniques and through Model Predictive Control. The next step will be to study, through optimization techniques, the optimal evasive planning, in terms of waypoint.

Regarding the control system, the candidate will develop the logics needed to manage automatically the on-board actuators; with the aim to perform, without human intervention, several manoeuvres (both standard and evasive) characterized by waypoints, course and speed settings.

The problem constraints will be properly formulated: geographical/topological, dynamics of the main elements of the propulsion line, and kinematics of the hull, which allow obtaining an optimal solution by taking into account the boundary conditions.

A ship model (about one meter in length) will be used to test and confirm the effectiveness of the above studies and to verify both the type and the minimum number of sensors needed.

It will be necessary to develop a dynamic simulator in the time domain, based on detailed mathematical models representing the different subsystems of a surface vehicle, in order to virtually verify the performance of the avoidance system.

	The validation of the mathematical models and the control algorithms will be managed in three distinct phases, thanks to the support of the industrial partner. In all three phases, Real-Time Hardware in the Loop techniques will be used. The testing and validation approach will take place first using the scale model connected to the virtual guidance and control systems. This last is a crucial step in order to proceed with the second validation step: test a real controller, using the ship model simulator, to optimize and test the control logics, avoiding as far as possible the experimental tests. Eventually, the overall validation of the project will be carried out through a set of experimental tests, with all the components in a real environment, in model scale. During the stay at TU Delft's haptic control laboratory, the candidate will investigate the application of these innovative feedbacks to the decision support tools developed during the Ph.D.. Each quarter the progress of the activities will be documented through the drafting of a dedicated report. The candidate should hold a Master's degree in scientific disciplines, with a preference for degrees in engineering, and in particular in naval architecture or marine engineering or electronic engineering.
PhD FUNDING	The annual gross amount of the grant, including social security expenses to be paid by the recipient, is € 16,500.00. The amount of the doctoral grant shall be increased by 50% for an overall period of not more than 18 months, if the graduate student is authorized to by the teaching body to carry out research abroad. Starting from the first year, each graduate student will have, besides the grant, a budget for research activities in Italy and abroad which will not be less than 10% of the grant.
ADMISSION REQUIREMENTS	
COURSE ADMISSION	Admission is subject to the passing of the selection tests and is conditioned by the positive outcome of the medical examinations, where required, that are carried out in health facilities and aimed at ascertaining the suitability for the specific task in accordance with D. Lgs. No. 81/08.
REQUIRED QUALIFICATION	Degree which has been conferred according to the rules and regulations in force prior to the reform of didactic freedom in universities, or a specialist/II level degree or an equivalent foreign academic qualification.

SELECTION PROCESS	
SELECTION COMMITTEE	The committees are made up of at least 3 university professors for each course; they may be integrated by not more than 2 experts, who may also be foreign nationals, from public and private research institutions and structures.
ADMISSION TEST VENUE FOR MARINE ENGINEERING (CODE 7311)	Università degli studi di Genova, Department of Marine, Electrical, Electronic and Telecommunications Engineering (Dipartimento di Ingegneria navale, elettrica, elettronica e delle telecomunicazioni – DITEN), Polo Navale, via Montallegro 1, Genova.
ADMISSION TEST VENUE ELECTRICAL ENGINEERING (CODE 7310)	Università degli studi di Genova, Department of Marine, Electrical, Electronic and Telecommunications Engineering (Dipartimento di Ingegneria navale, elettrica, elettronica e delle telecomunicazioni – DITEN), via Opera Pia 11a, Genova.
TYPE OF ADMISSION TEST	• Comparative assessment of the qualifications/publications. • Written test (research project). • The interview consists in the discussion of the written test (research project) and the description of the candidate's research area of interest,

	also on the basis of previous activities stated in his/her scientific-professional curriculum. The tests are focused on confirming the candidates' aptitude for scientific research.
METHODS FOR INVITING THE CANDIDATES AND COMMUNICATING THE OUTCOMES OF THE TESTS	The **examination schedule** is as follows: **FOR MARINE ENGINEERING (CODE 7311)** • Evaluation of qualifications, curriculum and written test (research project): **18 July 2018, 9.00 am.** • Interview: **18 July 2018, 2.00 pm,** at Dipartimento di Ingegneria Navale, Elettrica, Elettronica e delle Telecomunicazioni (DITEN), Meeting room, ground floor, Via Opera Pia 11A **FOR ELECTRICAL ENGINEERING (CODE 7310)** • Evaluation of qualifications, curriculum and written test (research project): **19.7.2018, 9.00 am.** • Interview: **19.7.2018, 2.00 pm,** at Dipartimento di Ingegneria Navale, Elettrica, Elettronica e delle Telecomunicazioni (DITEN), via Opera Pia 11a, room D3. **Candidates can use video conference mode; and, for identification purposes, the candidate must show the original document of which he has deposited a certified copy at the time of application.** The **list of those admitted to the interview** will be affixed at the Department of Marine, Electrical, Electronic and Telecommunications Engineering (Dipartimento di Ingegneria navale, elettrica, elettronica e delle telecomunicazioni – DITEN) The **final lists** shall be announced on **10th August 2018**, and will appear solely on: • the noticeboard of the relevant research Departments/facilities for the research courses; • the noticeboard of the University; • on the Internet address https://unige.it/usg/it/dottorati-di-ricerca No information whatsoever shall be posted to candidates' domicile.
WRITTEN TEST	The research project (10 pages maximum) has to be attached to the online application form, and it must concern one or more research Projects/grants highlighted in the section 'TRAINING PROJECT'. The research project will be evaluated as practical test for the selection, together with the evaluation of the qualifications and the scientific-professional curriculum, in order to identify the candidate's aptitude for scientific research in terms of originality, feasibility, clarity in the definition of objectives, methods and expected results.
INTERVIEW	The interview consists in the discussion of the written test (research project) and the description of the candidate's research area of interest, also on the basis of previous activities stated in his/her scientific-professional curriculum During the interview, the candidate shall also prove his/her proficiency in the following foreign language: English. Non-Italian candidates will also have to prove knowledge of the Italian language.
PERCENTAGE VALUES OF TO EACH TEST	To each candidate can be assigned a maximum of 150 points, divided as follows: - comparative assessment of the qualifications/publications: max score

	30/30, pass mark 20/30. - Written test (research project): max score 60/60, pass mark 40/60. - Interview: max score 60/60, pass mark 40/60. The final ranking will be drawn up by adding the scores assigned in comparative assessment, written test and interview. Candidates will be selected in compliance with the principles of equal opportunities.
ADDITIONAL CRITERIA FOR ADMISSION TO THE COURSE	In the case of equal grades, the evaluation of candidates' incomes prevails for the assignation of grants, as per D.P.C.M. 9 April 2001

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