ACADEMIC BOARD

Ph.D. in Physical and Engineering Sciences for Innovation and sustainability (XXXVIII and XXXIX Cycle)

Annual planning of training activities

April 2023

Summary

1 Premise

The training activities , collegial and individual, proposed to doctoral students follow what is indicated in the doctoral form (review form and initial design document) which is reported below.

n.	Name of the ins egname nto	Numer o of Total hours on the int ero cycle	Distribution during the cycle of doctorate (years in which the teaching of the to is active)	Course description	Teachers R eference	Final Verifica tion	Notes
1	Laborato ry of Physics, Chemist ry and Mathem atics	41	1,2	The aim of this workshop is to teach students to reason in a scientific way by interpreting the behavior of some very simple natural phenomena. Normally, the experiences that are part of an educational laboratory are based on activities that are carried out mechanically to verify a law, confirm hypotheses, etc. In this workshop we want to ask ourselves questions whose answers will come only after careful reasoning. Tomorrow, when we are faced with a new problem, there will be no manual from slavishly follow but we will have to answer ourselves in first person.	Proff. Matteo Martini, Sabino Meola, Donatella Barisano, Stefano Stendardo, Fabio Happacher, Giovannella Simona, Fabio Rinaldi, Stefano Viaggiu	YES *(The student will have to prepare and deliver a report for ever y experience. This documentatio n will then be discussed during the an oral exam. The test has a Avera ge duration of 30 minutes.)*	*The course includes a minimum laboratory experience of about 3 hours for 7 days. This experience, to be agreed with the teacher, can be carried out by the student in his/her home or in available institutions/companies or in the Marconi laboratory, located in via Paolo Emilio 29. The tests must then be supported by a technical report to be delivered during the exam. These approximately 21 hours are accompanied by 10 hours of individual study activities (study of laboratory regulations, teaching materials and texts) and 10 hours for the drafting of the paper*
2	Innovati ve Technol ogy Laborat ory for sustaina ble energy systems	41	1,2	The aim of this workshop is to provide students with the techniques of design, use and analysis of the main applications through direct contact with software and machinery. The student carries out simulation and/or experimental experiences in the laboratory in order to directly apply the notions learned during the degree courses and verify his/her skills on these techniques (simulative/experimental) of industrial applications increasingly required by the working world. Compatibly with the planning of research activities, the student will also be able to participate in laboratory experiences integrated into research projects at in which the university participates	Proff. Fabio Orecchini, Enrico Bocci, Romeo Giuliano, Umberto di Matteo, Stefania Proietti, Alberto Garinei, Arcidiacono Gabriele, De Luca Ernesto William, Garinei Alberto, Citti Paolo	YES *(The student will have to prepare and deliver a report for ever y experience. This documentatio n will then be discussed in presence at the Via Paolo Emilio 29. The test lasts an average of 30 minutes.)*	*The course includes a minimum laboratory experience of about 3 hours for 7 days. This experience, to be agreed with the teacher, can be carried out by the student in his/her home or in available institutions/companies or in the Marconi laboratory, located in via Paolo Emilio 29. The tests must then be supported by a technical report to be delivered during the exam. These approximately 21 hours are accompanied by 10 hours of individual study activities (study, laboratory regulations, teaching materials and texts) and 10 hours for the writing of the paper*
3	Urbanist Design Laborato ry ica	41	2,3	The aim of this workshop is to provide students with the techniques of design, use and analysis of the main urban design tools. The Student Carries Out Experiences	Proff. Cinzia Bellone, Stefania Lirer, Ernesto Grande	YES *(The student will have to draw up and deliver A minimum of*	*The course includes a minimum laboratory experience of about 3 hours for 7 days. Such experience, from agree with the teacher,*

				simulation and/or experimental in order to directly apply the notions learned during the degree courses and verify one's skills on these techniques (simulative/experimental). Compatibly with the planning of research activities, the student will also be able to participate in laboratory experiences integrated into the research projects in which the university participates		*5 graphic drawings and a Short report (30 pages). This documentation will then be discussed in presence at the Via Paolo Emilio 29. The test lasts an average of 30 minutes.)*	*it can be carried out by the student in his/her home or in available institutions/companies or in the Marconi laboratory, located in via Paolo Emilio 29. The tests must then be supported by a technical report to be delivered during the exam. These approximately 21 hours are accompanied by 10 hours of individual study activities (study of laboratory regulations, teaching materials and texts) and 10 hours for the drafting of the paper*
4	Meetings of Physics and Modern Physics at	10	1	The course allows you to acquire a greater mastery of the mathematical-physical sector. The topics of study are divided into lessons on: -pedagogy - Mathematics and statistics - Modern physics -cosmology -radiation protection - Didactics of the laboratory - Physics Laboratory - Quantum mechanics -Special relativity	Proff. Matteo Martini, Sabino Meola, Donatella Barisano, Stefano Stendardo, Fabio Happacher, Giovannella Simona, Fabio Rinaldi, Stefano Viaggiu Carlo Iazzeolla	NO	
5	Industry 4.0	10	1	The course allows students to develop a critical and transversal vision of today's industrial automation, introducing the PhD student to the knowledge of new production technologies in order to create new business models, increase plant productivity and improve product quality. The topics of study are divided into lessons on: -Innovation in Enterprises and Public Administration: The Challenge of Digital Transformation -Engineering 4.0: Sustainable innovation -Enterprises and Entrepreneurs 4.0: Opportunities and Threats of the Fourth Industrial Revolution -Industry and Finance 4.0: Competitive and Organizational Impacts of the Fourth Industrial Revolution -Project management in the of digital transformation	Proff. Fabio Orecchini, Enrico Bocci, Romeo Giuliano, Umberto di Matteo, Stefania Proietti, Alberto Garinei, Arcidiacono Gabriele, De Luca Ernesto William, Garinei Alberto, Citti Paolo	NO	

Table 1. Courses included in the didactic activities reported in the doctoral form (point 4 of the training project).

n.	Type of Activity	Description of the activity (and how to access the infrastructures for national doctorates)	Reference curriculum vitae, if any,
1	**Seminars**	The courses presented in the curricular teaching offer are associated with a wide range of seminars, both specialized and multidisciplinary, in order to offer doctoral students opportunities for in-depth study in the individual disciplinary areas but also for exchange and fruitful interaction between them. Therefore, training activities are planned that will address issues related to the research process or to the scientific questions on which studies can be developed by merging approaches of different specialized matrix and following them with round tables of experts that favor a fruitful exchange between disciplines as well as the interaction between teachers and students such as, for example, participation in meetings of international projects. The seminar activities will also be aimed at training aimed at the acquisition of transversal skills, which concern scientific communication, the use of the most suitable technologies for the acquisition of the results that are the objective of one's research, teaching skills and knowledge regarding national and international research systems such as those developed during European research projects (think of the European Research Area, horizon result buster, etc). The seminar activities will be structured in multiple forms (seminars, workshops, webinars, conferences, ...) and will involve the participation of the Professors belonging to the Doctoral Board, but also of other figures of scientific experts (other Professors within the University, Professors belonging to other Italian or foreign universities, scientific experts belonging to institutions of research and Italian and foreign companies).	
1	**Activity in -person and remote laboratory**	The planned teaching activities will be accompanied by practical experiences according to the acquisition of application skills. The research activities will be able to benefit from qualified and specific operational and scientific structures, including laboratories equipped for research such as the laboratory described above in which to carry out experiments both in presence and remotely (e.g. for long term tests) on electrical, electronic, IT and energy systems (capacitors, batteries, cells/electrolyzers, conditioning with catalysts A/O Sarveni)	**Physics Chemistry o Industrial Engineering**
2	**Activities at research infrastructures**	Research activities will be able to benefit from qualified and specific operational and scientific structures, including laboratories equipped for research. This will take place at the administrative and operational offices of the University, but also at institutions with which the University and the Department of affiliation have established agreements for research activities. Among these, it is possible to mention in particular national and international research infrastructures such as the CNR/INFN, ENEA, CERN, FERMILAB, ecc.	**Physics Chemistry o Industrial Engineering**
	Language improvement	As part of the PhD course, the increase in competence in expression and comprehension in English, with reference to both written and spoken language, will be promoted at several levels. PhD students will be offered the opportunity to have access to the English language courses that are part of the University's educational offer. The use of spoken and written English will also be encouraged, both in oral communication involving international interlocutors and in the use of international scientific articles. This will take place both in the context of the teaching offer and in that of the research activity. Periods of study and research abroad will also be encouraged.	
	Further education in computer science	As part of the PhD course, the increase in computer skills will be promoted at several levels. PhD students will be offered the opportunity to have access to computer science courses that are part of the University's educational offer. The use of IT tools in research activities will also be encouraged. In particular, the competence of PhD students in the use of databases and software functional to specific research paths will be promoted. In particular, the skills useful for carrying out research of scientific literature in the Databases will be increased; data management and analysis; the drafting of written and graphic scientific communication products. This will take place both in the context of the teaching offer and in that of the research activity, so that the use of software such as ASPEN and SIMAPRO.	
	Research and knowledge management of European and international research systems	As part of the PhD course, particular attention will be paid to training PhD students in the management of the research process in all its phases. In addition, knowledge regarding national and international research systems will be promoted, as a function of the activation of scientific exchanges and the acquisition of expertise in attracting funds aimed at research. To this end, PhD students will be able to avail themselves of the support of the University's Research and Development Area. This structure provides managerial, financial, administrative and, in specific cases, technical-scientific support in the formulation and implementation of proposals in response to national and international funding calls. International	
	Exploitation and dissemination of the results, intellectual property and open access to the company's data and products research	PhD students will be supported in the enhancement and dissemination of the results achieved through the research carried out. To this end, specific teaching activities will be aimed at training in scientific communication, both written and oral, also in a foreign language, referring in a transversal way to the standards of the various disciplinary areas. Oral and written communication of the interim results of the research to peers, the rest of the scientific community and society will also be supported and encouraged, already during the course of the PhD. Open access to data and research results will be promoted, ensuring the protection of intellectual property.	

	Fundamental Principles of Ethics, Gender Equality and Integrity	In the Doctoral Course, specific attention will be paid to training in compliance with the principles of ethics and the rules of conduct that are essential for the scholar. Both in teaching and research activities, the transmission of fundamental principles will be promoted, such as integrity, respect for the dignity of the person, competence, social responsibility and the protection of well-being. A part of the curricular and seminar teaching activity will be dedicated to these topics, providing PhD students with references to the available ethical codification and expanding its application in a transversal sense to the disciplines. In the management of the Doctorate, compliance with principles such as gender equality, enhancement and and the reduction of territorial gaps.	

Table 2. Other didactic activities reported in the Ph.D. form (point 4 of the training project)

2 Definition of training activities

The Ph.D. program provides for the acquisition of 180 credits over the three years, approximately 60 per year. Of these, 36 can be acquired through the attendance of ad hoc institutional courses for doctorates, and master's degree courses, if compatible. The other credits are acquired through other training activities. In the 3 years, the PhD student must acquire 36 credits of ad hoc courses (approximately 12 credits per year) and 144 credits of other educational activities (approximately 48 credits per year). Both the ad hoc courses and the other training activities are consistent with the objectives of the course and with the outgoing cultural and professional profiles and refer to I and II level teaching activities with the use of innovative methodologies (virtual laboratories, online courses, etc.). In particular, these activities follow what is indicated in the PhD sheets reported in Table 1 and Table 2 and can be classified into the following categories:

- Marconi transversal and specialized ad hoc courses (on average 2 courses per year of 6 CFU)
- Other educational activities (on average 48 credits including 10 credits per year for the writing of the thesis):
- Doctoral Schools (1 CFU = 6 hours, on average 24 hours for 6 CFU)
- Advanced training courses provided by third parties (1 CFU = 6 hours/1 day of course, on average 1 day)
- Participation in conferences, study days, workshops, conferences and webinars of other scientific profile (1 CFU = 6 hours/1 day, on average 1 day)
- Periods of study and research in other Italian and foreign universities (6 credits for each month at foreign subjects, 3 credits for each month at national subjects)
- Laboratory activities in presence and remotely (10 CFU for specific activity certified by the tutor)
- Publication in scientific journals (first-level or quartile 1 journals are valued at 10 credits, publications in minor journals 5 credits)
- Review of articles in scientific journals (2 CFU per article reviewed with a certificate from the journal or similar test)
- Research management: participation in national/international research calls and research projects (2 CFU for each project drafting activity per call or project report certified by the tutor)
- Participation in teaching and tutoring activities consistent and compatible with the research activities carried out (2 ECTS credits for teaching and/or tutoring activities certified by the tutor)
- Writing of the doctoral thesis (30 CFU)
- Other activities consistent and compatible with the research activities carried out proposed by the tutors and approved by the Academic Board

3 Training

On the basis of the above, the educational offer for the Ph.D. in Physical Sciences and Engineering for Innovation and Sustainability (XXXVIII Cycle) is defined below.

3.1 Marconi Courses

3.1.1 Courses on cross-cutting topics

Such courses may cover security, languages, computer science/data management, valorisation, management, ethics and research transfer, etc.:

- General training on workers' safety https:// www.unimarconi.it/formazione-generale-lavoratori-safety/ ECTS 6
- English Language Laboratory Teacher Prof. Russo Giuseppina CFU 6 https:// www.unimarconi.it/laboratori-virtuali/
- CAD-CAE Drawing Laboratory Lecturer Prof. Malerba Massimiliano CFU 6
- Data Driven Marketing Laboratory Lecturer Prof. Cocola Pamela CFU 6
- Other courses proposed by the tutor that are consistent and compatible with the research activities carried out by the PhD student

3.1.2 Specialist Courses

- Urban Design Laboratory 6 CFU
- Laboratory of Industrial Applications 6 CFU
- Laboratorio: Data Driven Operations for Industry 4.0, Docente Prof. Polidoro Alessandro 6 CFU
- Advanced SAR Interferometry Laboratory for Land Monitoring (Lecturer Benedetta Antonelli 6 CFU)
- Other courses proposed by the tutor that are consistent and compatible with the research activities carried out by the PhD student

3.2 Other educational activities

3.2.1 Doctoral Schools

Marzo 2023 (4 CFU 24 h) 4th Winter School for PhD students on FLUID MACHINES AND ENERGY SYSTEMS University of Pisa (https://www.unipi.it/index.php/engineering/item/11363-summer-school-fluid-machinery-and-energy-systems-engineering)

June 2023 (4CFU, 24h): Vibrational Spectroscopy meets Geosciences (GeoVibrS), University of Milan (https://sdt.ariel.ctu.unimi.it/projects/sdt/contents/2023SeveralTeachers.pdf)

July 2023 (4CFU, 24h) Doctoral School of the National Group of Geotechnical Engineering GNIG, University of Palermo (https://unikore.it/didattica/dottorati-di-ricerca/scuola-di-dottorato-cnrig-2023/.

July 2023 (4CFU, 24h) Summer School on "Metal 3D Printing in Construction" held at University of Bologna. The Summer School is aimed at providing a contribution to the large-scale use of 3D printing of metallic materials in construction, looking in particular at the design, optimization and durability aspects. (https://www.unibo.it/en/teaching/summer-and-winter-schools/2023/metal-3d-printing-in-construction)

Other doctoral schools proposed by the tutor that are consistent and compatible with the research activities carried out by the PhD student

3.2.2 Advanced training courses provided by third parties

The Italian Thermotechnical Committee: https://www.cti2000.it/index.php?controller=formazione&action=corsi, the Order of Engineers of Rome https://ording.roma.it/formazione/ and the American Society of Mechanical Engineers (ASME) https:/www.asme.org/conferences-events continuously organize advanced training courses, for example the May 2023 courses of ASME are reported:

- 01-05 2023 Fracture Mechanics
- 01-05 2023 ASME BPV Code Section VIII Division 1 Design & Fabrication of Pressure Vessels

Corsi di Formazione International Centre for Mechanical Science CISM – Udine (https://www.cism.it/en/about/presentation/). CISM, International Centre for Mechanical Sciences, is a non-profit organization, founded in 1968 to favour the exchange and application of the most advanced knowledge in the mechanical sciences, in interdisciplinary fields like robotics, biomechanics, environmental engineering and in other fields (mathematics, information and system theory, operations research, computer science, artificial intelligence). La scelta del Corso da parte dei Dottorandi è condivisa con il relatore ed il Consiglio dei Docenti. (https://www.cism.it/en/activities/courses/?year2023/)

TerreLogiche Training Courses (https://www.terrelogiche.com/formazione-terrelogiche.html) that belong to five different thematic groups: GIS, Environment, Surveying and Modeling, Programming, Data Analysis/Data Science. TerreLogiche has the ISO 9001:2015 Certification in the E37 sector for the

Training (https://www.terrelogiche.com/formazione-terrelogiche/scopri-i-corsi.html). The TerreLogiche courses currently accredited and validated by the CNAPPC (National Council of Architects, Planners, Landscapers and Conservationists) can provide training credits for Geologists pursuant to Article 7, paragraph 9 of the APC (Continuous Professional Updating) regulation, approved by the National Council of Geologists and the Ministry of Justice (B.U. 15 January 2018). The choice of the course by the PhD students is shared with the supervisor and the Academic Council.

Other advanced training courses proposed by the tutor that are consistent and compatible with the research activities carried out by the PhD student

3.2.3 Participation in conferences, study days, workshops, conferences and webinars of high scientific profile

Among the training activities suggested in the course of the PhD Course, there are conferences, study days, workshops, conferences and webinars of high scientific profile mainly carried out by national and international technical committees. The choice of PhD students is shared with the supervisor/tutor and the Teaching Council. With a view to interactive teaching, each of these meetings will be accompanied by a synchronous lesson held by the respective speakers/tutors. These lectures will be aimed both at deepening the topics underlying the proposed seminars and at allowing doctoral students to take full advantage of these meetings in order to provide them with an educational contribution in the context of their research activity.

AIMSEA (Italian Association of Fluid Machines and Systems for Energy and Environment) Conferences:

- ICE 2023 (6 CFU 1 giorno) "16th International Conference on Engines & Vehicles for Sustainable Transport" Island of Capri, Naples, Italy. https://www.ice2023.info
- 78th ATI National Congress (6 CFU 1 day) ENERGY TRANSITION: Research and Innovation for Industry, Communities and the Territory Carpi (MO) 14-15 September 2023 https://www.atinazionale.it/congresso-2023

The Italian Thermotechnical Committee: https://www.cti2000.it/index.php?controller=formazione&action=corsi, the Order of Engineers of Rome https://ording.roma.it/formazione/ and the American Society of Mechanical Engineers (ASME) https:/www.asme.org/conferences-events continuously organize conferences, webinars, workshops, etc., for example the May 2023 conferences of ASME:

- May 01-04 2023 Offshore Technology Conference (OTC) HoustonNRG Park - Houston, Texas
- May 15-18 2023 Bioprocessing Equipment Meeting (BPE 2023)Royal Sonesta Hotel, New Orleans, LA
- May 17-19 2023 VVUQ Verification, Validation, and Uncertainty Quantification Symposium

The *International Society for Soil Mechanics and Geotechnical Engineering* (**ISSMGE**, https:// www.issmge.org/) continuously organizes webinars on specific topics of great relevance in the field of international research, with the collaboration of international technical committees.

- ISSMGE Interactive Technical Talks TC16 – Sustainability in Geotechnical Engineering - Episode 5 (March 2023): The fifth episode of International Interactive Technical Talk has just been launched and is supported by TC307 (Prof. Md. M. Rahman, Dr. S.Rios and T. R.Smaavik)
- ISSMGE Interactive Technical Talks TC16 – Unsaturated soils - Episode 6 (April 2023): The sixth episode of International Interactive Technical Talk has just been launched and is supported by TC106 (Prof. E.Romero, Dr. M. Saleh and L.Chen)
- ISSMGE Virtual University (http://virtualuniversity.issmge.org/): a virtual platform organized by ISSMGE where it is possible to participate in courses and seminars, recorded by leading experts in the various fields of Geotechnical Engineering.

The *International Association for Bridge and Structural Engineering*, (***IABSE***; https:// www.iabse.org/) organizes webinars on specific topics of great relevance in the field of international research, with the collaboration of international technical committees.

- IABSE Webinar Seismic Isolation and Response Control Systems (SED 19)
- IABSE Webinar *Use of Structural Health Monitoring in Condition Assessment of Bridges: Potential Changes*
- IABSE Webinar Characteristic Seismic Failures (by Andreas Lampropoulos)

Other meetings proposed by the tutor that are consistent and compatible with the research activities carried out by the PhD student

3.2.4 Activities at other Italian research infrastructures (study and research periods)

Doctoral students can carry out periods of study and research in other Italian locations at institutions with research departments (e.g. research institutions, universities, companies) with which the University and the Departments to which the doctorate belongs have established agreements for research activities. Among these, it is possible to mention in particular national and international research infrastructures such as CNR/INFN, ENEA, CERN, FERMILAB, (e.g. 4 members of the PhD board are ENEA and INFN), Sapienza University (DIAEE and SBAI departments), University of L'Aquila (DIIE department), Tor Vegata University (DII department), Campus Biomedico University (DIC department), Roma 3 University (DII department), University of Genoa (DICCA Department), Politecnico di Milano (DE Department), Institute of Information Science and Technology (ISTI), FERRARI SpA – Maranello (MO), FIAT RESEARCH CENTRE – Orbassano (TO), GE OIL & GAS – NUOVO PIGNONE – Florence (FI), BONFIGLIOLI RIDUTTORI S.p.A. (BO), PIAGGIO & C. SpA – Pontedera (PI), ASSOKNOWLEDGE – Rome (RM), TOYOTA MOTOR

ITALIA S.p.A – Rome (RM), SOLIDPOWER SpA – Trento (TN), WALTER TOSTO SpA – Chieti (CH), ENERECO SpA – Fano (PU), ICI CALDAIE SpA – Verona (VR), SNAM SpA – San Donato Milanese (MI), RAMPINI SpA – Passignano sul Trasimeno (PG), etc.

3.2.5 Activities at research infrastructures (periods of study and research) abroad

PhD students can carry out periods of study and research in other foreign locations at institutions with research departments (e.g. research institutions, universities, companies) with which the University and the Departments to which the doctorate belongs have established agreements for research activities. Among these, it is possible to mention: Imperial College London – UK, Ohio State University Columbus – USA, Fermilab – USA, CERN – SWITZERLAND, MIT – Massachusetts Institute Of Technology – USA, FZJ – Germany, University of California (Computer Science Department) – USA, Stanford University (Electrical Engineering Department) – USA, Universitè de Strasbourg – France, Huelva University – Spain, Eindhoven University of Technology – Netherlands, Technischen Universität Wien – Austria, MARIE TECNIMONT SpA - France, IDIADA SpA - Spain, BALLARD SpA - Sweden, MARION TECHNOLOGIES SpA - France, CALIDA CLEANTECH Srl - Germany, MAYHTEC - France, HYGEAR - Netherlands.

3.2.6 In-person and remote laboratory activities

The laboratory activities consist of the attendance in presence or remotely of the Marconi Laboratory consisting of 150 m2 divided into 4 environments: electrical/electronic/informatics/technical physics for development and testing on batteries, UCs, cells/electrolyzers, electric motors (power supplies and programmable loads, Glove Box); thermo/electrochemistry performs reactions with product analysis (Technical gases, Mass flow controllers, micro-GC, GC-MS, EIS, TGA/DSC, Furnaces, Laser granulometer); systems and controls, mechanics (Lathe, Drill press, etc.), various PC workstations and Server rooms in which to carry out experiments both in presence and remotely (e.g. for long term tests) on electrical, electronic, computer and energy systems (capacitors, batteries, cells/electrolyzers, conditioning with catalysts and/or sorbents). The laboratory PCs are equipped with specific software (some connecting via VPN to the institutions with which Marconi has agreements) for design, analysis, simulation: Microsoft Dreamspark Premium (Windows, Office, Visio, Project, Visual studio, Mathematics, Robotics, Power BI, Sway, etc.); AutoDesk Academia(AD-CAM; P&ID, 3D, etc); Mathematicians: (Mathematica; Drifts; Scilab); Simulation (ASPEN and SIMA PRO Marconi licenses; Matlab, Labview, Ansys, etc. from other agencies).

4 Planning and Monitoring of training activities

At the beginning of the year (therefore by December of each year), for the planning and approval of training activities, each doctoral student (therefore the doctoral students who have just won the call and the doctoral students who must be admitted to the second and third year) must draw up and deliver to the tutor an annual activity plan for approval by the teaching body according to the model shown below.

At the end of the year (therefore by December of each year), for the monitoring of the training activities of the doctoral students, each doctoral student (for which the doctoral students who have completed the first, second or third year) will have to draw up and deliver to the tutor a document of summary of your training activities according to the model below.

This activity must be approved by the teaching body of the doctoral course.

Training activity planning form

(This Activity Plan must be completed and signed by the PhD student)

PhD STUDENT	SURNAME AND NAME
DOCTORAL COURSE	PHYSICAL AND ENGINEERING SCIENCES FOR INNOVATION AND SUSTAINABILITY
ACADEMIC YEAR	CYCLE 3X -202Y/202Z
TUTOR	SURNAME AND NAME
TYPE OF SCHOLARSHIP	(indicate: NO o ATENEO, PNRR, ALTRO)
ACTIVITY SUSPENSION	(indicate: NO o da XX/YY/202Z a XX/YY/202Z)
RESEARCH TOPIC	(indicare the tentative title)
CONSISTENCY WITH THE DOCTORAL PROGRAM AND TEACHER BOARD	(frame the scientific sector of the research and connect it to the doctorate and to members of the college)
METHODOLOGIES AND CONTENTS OF THE ACTIVITY	(indicate what the activities are with the methodologies: for example state of the art analysis, simulation/experimentation development, results analysis)
EQUIPMENT AND SOFTWARE	(indicate if necessary PC, programs, tools, etc.)
DEGREE OF INNOVATION	(indicate why the theme and/or activity and/or methodologies are innovative)
TIMELINE AND FEASIBILITY	(indicate the timing of the activities and how SoA analysis/simulation/experimentation/analysis of results are feasible)
ACTIVITIES WITH OTHER NATIONAL AND/OR FOREIGN BODIES	(indicate whether national and/or foreign bodies are necessary and for which activity/methodology/tool/software)

SKILLS YOU WANT TO ACQUIRE	(indicate the skills expected at the end of the doctorate)
ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS	(indicate the impact of the research on institutions/companies, on society and on the environment)

PROPOSES

THE FOLLOWING ACTIVITIES PLAN FOR THE YEAR 11/202X-11/202X

1. **Transversal Marconi courses: language, data analysis/statistics, research/publications, software, sustainability, security, etc.**
2. **Specialist Marconi courses: Urban Planning Laboratory, Industrial Applications Laboratory, Data Driven Operations for Industry 4.0 Laboratory; Advanced satellite SAR interferometry laboratory for territorial monitoring, etc.**
3. **Training activities of other bodies: Transversal and specialist courses of other universities, doctoral schools, courses of other bodies (CTI, Orders, ASME, CISM, etc.)**
4. **Participation in meetings and conferences of another scientific profile: IEA, IEEE, EHFC, EFCH, WHEC, SDEWES, EUBCE, ICEBB, ATI, ICE, CTI, Ordini, etc.**
5. **Participation in study days, workshops, seminars: IEA, IEEE, ATI, ICE, CTI, Orders, etc.**
6. **Periods of study and research in other Italian locations**
7. **Periods of study and research in other foreign locations**
8. **Laboratory activities**
9. **Publication in scientific journals**
10. **Publications in conference proceedings**
11. **Review of scientific journal articles**
12. **Participation in national/international research calls and research projects**
13. **Participation in teaching and tutoring activities consistent and compatible with the research activities carried out (2 CFU for teaching and/or tutoring activities certified by the tutor)**
14. **Drafting of the doctoral thesis**
15. **Other activities consistent and compatible with the research activities carried out proposed by the tutors and approved by the teaching bodyTHE FOLLOWING BUSINESS PLAN FOR THE YEAR 11/202X-11/202X**

Date XX/YY/202Z Signature

Training activity monitoring form

(This Activity Declaration must be completed and signed by the PhD student)

PhD STUDENT	SURNAME AND NAME
DOCTORAL COURSE	PHYSICAL AND ENGINEERING SCIENCES FOR INNOVATION AND SUSTAINABILITY
ACADEMIC YEAR	CYCLE 3X -202Y/202Z
TUTOR	SURNAME AND NAME
TYPE OF SCHOLARSHIP	(indicate: NO o ATENEO, PNRR, ALTRO)
ACTIVITY SUSPENSION	(indicate: NO o da XX/YY/202Z a XX/YY/202Z)
RESEARCH TOPIC	(indicare the tentative title)
CONSISTENCY WITH THE DOCTORAL PROGRAM AND TEACHER BOARD	(frame the scientific sector of the research and connect it to the doctorate and to members of the college)
METHODOLOGIES AND CONTENTS OF THE ACTIVITY	(indicate what the activities are with the methodologies: for example state of the art analysis, simulation/experimentation development, results analysis)
EQUIPMENT AND SOFTWARE	(indicate if necessary PC, programs, tools, etc.)
DEGREE OF INNOVATION	(indicate why the theme and/or activity and/or methodologies are innovative)
TIMELINE AND FEASIBILITY	(indicate the timing of the activities and how SoA analysis/simulation/experimentation/analysis of results are feasible)
ACTIVITIES WITH OTHER NATIONAL AND/OR FOREIGN BODIES	(indicate whether national and/or foreign bodies are necessary and for which activity/methodology/tool/software)
SKILLS YOU WANT TO ACQUIRE	(indicate the skills expected at the end of the doctorate)
ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS	(indicate the impact of the research on institutions/companies, on society and on the environment)

The undersigned, in full coherence with the topics envisaged by the research project and in compliance with the commitment undertaken to carry out the periods of activity foreseen by the doctoral path, aware of the criminal liability which he may face in the event of a false declaration or in any case not corresponding to the true (art. 76 of Presidential Decree no. 445 of 12/28/2000), pursuant to Presidential Decree. n. 445 of 12/28/2000 and subsequent amendments.

CERTIFY

THE FOLLOWING ACTIVITIES DONE FOR THE YEAR 11/202X-11/202X
1. **Transversal Marconi courses: language, data analysis/statistics, research/publications, software, sustainability, security, etc.**
2. **Specialist Marconi courses: Urban Planning Laboratory, Industrial Applications Laboratory, Data Driven Operations for Industry 4.0 Laboratory; Advanced satellite SAR interferometry laboratory for territorial monitoring, etc.**

3. **Training activities of other bodies: Transversal and specialist courses of other universities, doctoral schools, courses of other bodies (CTI, Orders, ASME, CISM, etc.)**

4. **Participation in meetings and conferences of another scientific profile: IEA, IEEE, EHFC, EFCH, WHEC, SDEWES, EUBCE, ICEBB, ATI, ICE, CTI, Ordini, etc.**

5. **Participation in study days, workshops, seminars: IEA, IEEE, ATI, ICE, CTI, Orders, etc.**

6. **Periods of study and research in other Italian locations**

7. **Periods of study and research in other foreign locations**

8. **Laboratory activities**

9. **Publication in scientific journals**

10. **Publications in conference proceedings**

11. **Review of scientific journal articles**

12. **Participation in national/international research calls and research projects**

13. **Participation in teaching and tutoring activities consistent and compatible with the research activities carried out (2 CFU for teaching and/or tutoring activities certified by the tutor)**

14. **Drafting of the doctoral thesis**

15. **Other activities consistent and compatible with the research activities carried out proposed by the tutors and approved by the teaching bodyTHE FOLLOWING BUSINESS PLAN FOR THE YEAR 11/202X-11/202X**

Date XX/YY/202Z Signature