THE RECTOR

GIVEN	The Charter of the University Mediterranea of Reggio Calabria, issued by Rectoral Decree n. 92 of 29 March 2012, published in G.U. of the Repubblica Italiana dated 13 April, 2012, no. 87;
GIVEN	Law n. 210 dated 3July 1998, in particular to art.4, as amended by Article 19, paragraph 1, of Law n. 240 of 30 December 2010.
GIVEN	Law n. 241 of 7 August 1990 "*New provisions on administrative procedures and right to access administrative documents*", as amended by Legislative Decree 127 of 25 november 2016, Legislative Decree n. 222 of 25 november 2016 and Legislative Decree n. 104 of 16 june 2017.
HAVING REGARD,	in particular, to Articles 9 and 17 of Ministerial Decree n. 226 of 14 December 2021 "R*egulations concerning the accreditation of seats and PhD courses and criteria for the provision of PhD courses by accredited bodies"* published in the Official Gazette, General Series n. 308 of 29 December 2021;
HAVING REGARD TO	art. 1 of Ministerial Decree no. 247 of 23 February 2022 with provides, from July 1, 2022, for the annual amount of the scholarship at € 16.243,00 gross of social security contributions that must be paid by the PhD Student;
GIVEN	"University Regulations for PhDs" issued by Rectoral Decree no.76 of 14 March 2022;
GIVEN	The Ministerial Decree no. 301 of 22 March 2022, concerning "*Guidelines for the accreditation of PhD courses, which redefined, in terms of indicators and parameters, the general requirements for the re-accreditation of PhD courses*";
HAVING REGARD TO	the Regulations of the University Mediterranea of Reggio Calabria regarding Students Contribution - ex. art. 1 paragraph 254 of the Law n. 232, of 11 December 2016 - issued by Rectoral Decree no.181 dated 20 July 2017
HAVING REGARD TO	art. 17 EU Regulation 2020/852 which defines the environmental objectives, including the principle of not causing significant harm (DNSH, "Do no significant harm"), and the related Communication of the EU Commission 2021 / C 58/01;
GIVEN	the Ministerial Decree n. 344 of 8 April 2022, concerning the definition of the list of Countries to be understood as particularly poor and developing, for the academic year 2022/2023
GIVEN	the Directorial Decree (MUR) n. 1033 of 17 June 2022, admitting for funding the National Center for Sustainable Mobility, topic "Sustainable Mobility", application identification code CN00000023 of which the Mediterranean University of Reggio Calabria is "Affiliate of Spoke"
CONSIDERING	that the budget of the affiliated institution, University of Reggio Calabria, within the CNMS, covers n. 5 PHD scholarships
GIVEN	The Directorial Decree (MUR) n. 1032 of 17 June 2022, admitting for funding the "National Research Centre for Agricultural Technologies", topic "Agricultural Technologies (CN-Agritech)", application identification code CN00000022, of which the Mediterranean University of Reggio Calabria is "Affiliate of Spoke"
CONSIDERING	That the budget of the affiliated institution, University of Reggio Calabria, within the CN-Agritech covers n. 4 PHD scholarships
GIVEN	The Directorial Decree (MUR) n. 1549 of 11 October 2022, admitting for funding the "Extended partnerships RESearch and innovation on future

Telecommunications systems and networks, to make Italy more smART", Topic "14. T*elecommunications of Future*", application identification code PE00000001, of which the Mediterranean University of Reggio Calabria is "Affiliate of Spoke"

CONSIDERING That the budget of the affiliated institution, University of Reggio Calabria, within the PE Restsart covers n. 13 PHD scholarships

GIVEN The Directorial Decree (MUR) n. 1049 of 27 June 2022, admitting for funding the "Ecosystem of Innovation "Tech4You – *Technologies for climate change adaptation and quality of life improvement*", intervention "5.Climate, Energy and Sustainable Mobility", application identification code ECS00000009, of which the Mediterranean University of Reggio Calabria is "Affiliate of Spoke" and "Spoke";

CONSIDERING that the budget of University of Reggio Calabria, within the Ecosystem of Innovation "Tech4You" covers n. 17 PHD scholarships;

TAKING INTO ACCOUNT that, being the aforementioned three-year doctoral scholarships, and the projects must in any case, be completed by 28 February 2026, it is necessary to announce it with the utmost urgency so that scholarships can be attributed to the XXXVIII cycle of PhD Courses already in progress;

TAKING INTO ACCOUNT that the aforementioned notices provide that - "*at least 40% of the personnel employed or, in any case, beneficiaries of scholarships or fixed-term research contracts, are female*";

CONSIDERING that three-years PhD scholarship amount is € 60.107,22 and that such amount is increased in case of periods spent abroad, up to a maximum of 6 months, of € 5.008,94

CONSIDERING that the interventions covered by the funding provided for by the aforementioned decrees must be:

- **a)** consistent with the objectives and purposes of Regulation (EU) 2021/241, with the general strategy and the detailed Sheet of the Component of the PNRR;
- **b)** oriented towards the achievement of results measured with reference to milestones and targets assigned to the Investment and established by the Plan;
- **c)** compliant with the principle "not to cause significant damage" (DNSH), art.17 of regulation (EU) 2020/852, and consistent with the technical guidelines prepared by the European Commission (European Commission Communication 2021/C58/01);
- **d)** capable of addressing and bridging gender inequalities;
- **e)** in support of the participation of women and young people, also in line with the provisions of the decree-law of 31 May 2021, n. 77 (so-called Simplification Decree), modified by the conversion law n. 108 of 29 July 2021 concerning the management of the PNRR;

and must also:

- **f)** promote the exploitation of research results and guarantee the protection of intellectual property, ensuring open access to the public to research results and related data in the shortest time and with the least number of limitations possible, according to the principles of "Open science" and " FAIR Data"

GIVEN the resolutions of the Academic Senate and of the Board of Governors dated 11/14/2022, which authorized calls for applications for a total of n. 39 PhD scholarships funded on approved projects

GIVEN the urgency of proceeding with the call for the selection procedures for the attribution of the aforementioned PHD scholarships

DECREES

Article 1 – Announcement Public selection

1. Public selections are announced for admission to XXXVIII cycle , (a.a. 2022/2023), of the Research Doctorate Programs and assigning **n. 39 PhD scholarships** under the Italian National Recovery and Resilience Plan (NRRP) within Mission 4 "Instruction and Research", component 2 "*From Research to Business*", funded by the European Union NextGenerationEU for the projects: "National Centres", "Innovation Ecosystems" and "Extended Partnerships".
2. The **n. 39 PhD scholarships** are awarded as follows :
   - **n. 5 scholarships** funded by the Research Program of the National Sustainable Mobility Center (CN-MS), project identification code CN00000023, CUP: C33C22000240001;
   - **n. 4 scholarships** funded by the Research Program of the "National Research Center for Agricultural Technologies" (CN-Agritech), project identification code CN00000022, CUP: C33C22000260001;
   - **n. 13 scholarships** funded by the Extended Partnership "RESearch and innovation on future Telecommunications systems and networks, to make Italy more smART", (PE-RESTART), project identification code PE00000001, CUP: C37G22000480001;
   - **n. 17 scholarships** financed by the "Tech4You" Innovation Ecosystem project, (EI-T4Y), identification code ECS00000009, CUP: C33C22000290006.

   The distribution of scholarships among the PhD Courses is shown below:

INVESTMENT	PhD COURSES			
	ARCHITECTURE	**CIVIL, ENVIROMENTAL AND INDUSTRIAL ENGINERING**	**INFORMATION ENGINERING**	**AGRICULTURAL, FOOD AND FORESTRY SCIENCES**
CN-Agritech *CUP: C33C22000260001*			1	3
CN-MS *CUP: C33C22000240001*		1	4	
EI-T4Y *CUP: C33C22000290006*	3	5	4	5
PE-ReStart *CUP: C37G22000480001*			13	
TOTALI	3	6	22	8

3. **This call does not provide for assignment without scholarship, therefore, the renunciation of the scholarship will mean renunciation of attendance at the doctorate Program.**

4. All the information on the PhD scholarships, including the research topic of each of them, are in the sheets attached to this call as integral and substantial parts of it (Annex A).
5. The publication of this call at the following address: http://www.unirc.it/ateneo/albo.php and http://www.unirc.it/ricerca/scuola_dottorato.php, has the value of notification. Any changes, updates or additions to its content will be disclosed exclusively, with the publication to the same address.

6. The submission of the application form constitutes the acceptance of the rules contained in this announcement by the candidate. Failure to comply with these rules will result in the exclusion from the competition.
7. The Research Doctorate courses are three years in length and will start on February 1, 2023 and end on January 31, 2026.
8. This call is written in Italian and translated into English, in any case, the text writen in Italian will prevail.
9. The use of the male gender has no discriminatory character but, understood as a neutral gender, only responds to needs for more immediate communication.

Article 2 - General admission Requirements

1. Applicants, without any limitation of age nor citizenship, can apply for the PhD scholarships referred to in Annex A, must hold the following qualifications before this announcement deadline: a degree awarded prior to approval of Ministerial Decree D.M. n. 509/1999, an Italian degree known as "Laurea specialistica/magistrale" as specified for each PhD Course in Annex A, or an equivalent foreign academic qualification awarded abroad.
2. Can, also, apply for one of the PhD scholarships candidates who will achieve the necessary requirements for accessing the doctorate within 31 January 2023, under penalty of forfeiture in the event of a positive outcome of the selection. Should this be the case, the admission will be granted with reservation and the applicants must submit the self-certification of graduation in good time, under pain of the exclusion from the competition.
3. Applicants in possession of a foreign qualification that has not already been declared equivalent to an Italian degree, for taking part in the competition, must attach to the application form all the documents translated and legalized by the competent Italian Representations, in accordance with regulation in force relating to the admission of foreign students to courses in Italian universities, so as to allow the Selection Committee to evaluate the admission requirements and the admissibility of the foreign qualification in compliance with the legislation in force in Italy and in the country where the qualification was awarded and with international treaties or agreements on the recognition of qualifications for the continuation of studies
4. By the beginning of the courses, in any case, must be delivered to University Doctoral Office (Research and PhD Sector), together with the application form, the translated qualifications legalized in Italian and accompanied by the "Dichiarazione di Valore in loco" ("*Declaration of value*"), issued by the competent Italian Authorities of the Country in which the degree was awarded, or, alternatively, the Statement of comparability of the foreign university qualification issued by the ENIC-NARIC center in Italy (CIMEA) may be presented, which must contain all the information necessary for the evaluation of the qualification. For the applicants holding a degree awarded in a country of the European Union, the *diploma supplement* is sufficient.
5. Applicants already enrolled at another PhD course with scholarship cannot be admitted to this call. PhD Students who are already enrolled at a PhD course without a scholarship can access to this announcement, after passing the admission competition, but they must withdraw from the previous PhD course and start from the first year.
6. All applicants are admitted to the selection subject to verification of self-certified statements pursuant to Presidential Decree no. 445/2000 and subsequent amendments and additions. In the case of false declarations, subject to any criminal liability arising therefrom, the University, by a clearly justified decision of the Rector, may order at any time, the exclusion during the procedure and also after the start of the PhD course. Furthermore, the University, at any time, can carry out checks on the truthfulness of the declarations produced and request the presentation of the originals of the documents. Therefore, it can order at any time, with a

motivated provision, the exclusion of candidates from the selection due to lack of the requirements set out in this call.

Article 3 - Selection Application Form

1. The application form for admission to the selection procedure must be completed ONLY ON LINE from the day following the publication of the call on the website of the University. The application form must be completed **under penalty of exclusion,** by 27 December 2022 at 24.00 pm (Italian time.)

   To fill out the application, candidates must use the browser mozilla firefox or chrome:

   A. Italian applicants must access the link https://gomp.unirc.it via their SPID and if the name is not present in the University database, they must complete the registration with their personal data;
   the foreign applicants must access the link https://gomp.unirc.it and they must register with the system by clicking on the "register" button and complete the registration by entering their personal data;

   B. all applicants, from the Home-page, must follow the path: Home> Doctoral career> XXXVIII cycle doctorate call> ("Home > Carriera dottorati >bando dottorati XXXVIII ciclo"), choose the PhD course, fill in all the fields relating to the booking and attach the required documents required by this call for applications. Given the specificity of the scholarships referred to in this announcement, the choice of curriculum is to be considered merely indicative.

   C. Candidates must pay the fee for participation in the competition of € 65.00, in no case refundable, using only PagoPA (available on the GOMP platform). No other forms of payment are permitted, with the exception of candidates residing or domiciled outside the national territory, who will be able to pay the contribution of € 65.00 by bank transfer to the IBAN code **IT55V0200816303000401060714** [BIC / SWIFT UNCRITM1585] bank account of UNIRC at the UNICREDIT treasury of Reggio Calabria (Corso Garibaldi branch), indicating in the reason "PhD participation fee ..... (indicate the name of the PhD course)". Are exempt from paying the aforementioned contribution all the Candidates coming from particularly poor and developing Countries as defined by the Ministerial Decree of 8 April 2022, n. 344/2022. For the 2022/2023 academic year, are to be understood as particularly poor and developing Countries pursuant to the aforementioned Ministerial Decree the countries listed below: Afghanistan - Angola - Bangladesh - Benin - Bhutan - Burkina Faso - Burundi - Cambodia - Central African Republic - Chad - Comoros - Democratic People's Republic of Korea - Democratic Republic of the Congo - Djibouti - Eritrea - Ethiopia - Gambia - Guinea - Guinea Bissau - Haiti - Kiribati - Lao People's Democratic Republic - Lesotho - Liberia - Madacascar - Malawi - Mali - Mauritania - Mozambique - Myanmar - Nepal - Niger - Rwanda - São Tomé and Príncipe - Senegal - Sierra Leone - Solomon Islands - Somalia - South Sudan - Sudan - Syrian Arab Republic - Tanzania - Timor Leste - Togo - Tuvalu - Uganda - Yemen – Zambia

   D. All candidates residing in Italy must also send, by and no later than the expiry date of this call, exclusively by PEC, to the following address amministrazione@pec.unirc.it, the documentation indicated below:
      - application form for admission to the selection procedure, printed from the online procedure and signed in original;
      - research project (**Annex B**);
      - Curriculum Vitae in European format;
      - receipt of the payment of the participation fee of € 65.00 in no case refundable;
      - self-declaration of the degree certificate pursuant to D.P.R. 445 of 28 December 2000;
      - a copy of a valid identification document bearing the signature of the applicant;
      - any other documentation as requested in Annex A.

   E. foreign candidates, if unable to use certified e-mail, may forward the documentation indicated below to the e-mail address scuoladottorato@unirc.it by and no later than the expiry date of this call:
      - application form for admission to the selection procedure, printed from the online procedure and signed in original;

- research project (**Annex B**);
- Curriculum Vitae in European format;
- receipt of the payment of the participation fee of € 65.00 with the exclusion of the candidates referred to in the last sentence of letter C, falling within the case referred to in the Ministerial Decree of 8 April 2022, n. 344/2022.
- a copy of a valid identification document bearing the signature of the applicant;
- the equivalent academic degree (Master's Degree) awarded at a foreign University, as indicated in art. 2 point 3, or, if possessed the degree awarded at an Italian University, the self-certification pursuant to Presidential Decree 445 of December 28, 2000;
- any other documents indicated and required in Annex A.

2. If candidates intend to apply for participation in **different** PHD Courses, the procedure in this article must be repeated for each of the selected Courses, with the obligation to pay the participation fee for each application.
3. Within the **same** PHD Course, candidates which intend to compete for several scholarships, must submit a single application and an Attachment B for each type of scholarship chosen.

Application forms for admission to the selection procedure which are not signed or otherwise incomplete, incorrect, or received or delivered in ways different from those listed above will not be considered. It is responsibility of the candidates to verify the correct conclusion of the procedure
Non-EU citizens must attach to the application form all qualifications translated into one of the languages of the European Community and, after passing the admission tests, they must provide for the delivery of the qualifications as indicated in the previous article 2, point 3.
Candidates with disabilities, in accordance with the Law of February 5, 1992 n. 104, in relation to their handicap, must explicitly request the necessary aid, as well as any additional time to be able to take the competition tests. In this respect, all personal information will be kept confidentially in accordance with Legislative Decree 196/03.

Article 4 - Admission Procedures

1. Admission to the PhD courses takes place through a public selection aimed at assessing the applicant's attitude to scientific research and consisting of an evaluation by the **Selection Committee**, of the qualifications and the project presented by the applicants and an oral and foreign language exam.
2. The publication of the schedule of the admission tests, as shown in Annex A, constitutes notice to interested parties. Any changes to the examination procedures and the exams schedule will be by published, with notification value, on the University website at the following links: http://www.unirc.it/ateneo/albo.php and http://www.unirc.it/ricerca/scuoladottorato.php. **Other forms of notice will not be activated by this University**.
3. The **Selection Committee** will be appointed by the Rector at the expiry of this call, in accordance with Regulation of Research Doctorates of the of the *Mediterranea* University of Reggio Calabria.
4. Selection Committee can assign a maximum of 120 points to each applicant divided as follows: maximum 60 points for the evaluation of qualifications and the project and maximum 60 points for the oral test.
5. For the evaluation of the qualifications and the project, the Commission, in the preliminary session, establishes, within the scope of the scores referred to in paragraph 4, the evaluation criteria and methods to be formalized in the relative report in order to draw up the relative rankings.
6. The Commission will evaluate each applicant according to the following maximum scores to be awarded:
   - Curriculum vitae and studiorum Up to 30 points
   - Research project (Annex B) Up to 30 points
7. Candidates who have obtained a score of at least 42/60 are admitted to the oral exam.
8. The list of candidates admitted to the oral test, signed by the President and the Secretary of the Selection Committee, is sent by email to the following address: scuoladottorato@unirc.it for publication on the dedicated website (http://www.unirc.it/ricerca/scuola_dottorato.php)

9. **The oral exam, which will be held exclusively online**, consists of a **discussion on the research project presented**, also including the **verification of knowledge of the English language**. **Applicants, when submitting the application, must indicate their Skype contact.** Pursuant to the D.R. no. 87 of 15 March 2020, each candidate before the start of the test, shows the Selection Committee the valid identification document, in order to allow its identification, sending a copy to the e-mail address of the President who gives note, in the report, of the acknowledgment. **Failure to appear at the scheduled oral exam will be considered as a withdrawal from the competition.** The oral exam is public and it is considered passed only if the candidate obtains a score of no less than 42/60.
10. At the conclusion of the work, the Selection Committee draws up the list of candidates examined with the indication of the overall scores obtained by each applicant. Should there be a large number of candidates to be evaluated, the Commission may conclude the work the following day.
11. At the end of the selection process, the Selection Committee, will draft, for each scholarship, the final merit ranking lists of the applicants based on their individual score taking into account:
    - the constraints envisaged by the PNRR notices including: "at least 40% of the personnel hired or in any case recipients of scholarships or fixed-term research grants are female";
    - the provisions of art. 3 paragraph 7 of Law 5 May 1997, n. 127, in case of equal scores, which prescribes *preference for the younger candidate.*
12. The ranking lists, signed by the President and the Secretary of the Selection Committee, are sent by email to the following address: scuoladottorato@unirc.it for publication at the link: http://www.unirc.it/ricerca/scuola_dottorato.php.

Article 5 - Admission to the Course

1. The Rector, by decree, checks the validity of the examination deeds and approves the ranking lists. Applicants usefully placed in each ranking list are declared winners under the condition of ascertaining the requisites required for admission to the selection procedures and to the PhD course.
2. Candidates are admitted to the PhD course in order of ranking and subject to the availability of places for each doctorate. In the case of renouncers, before the start of the course, these will be replaced by an equal number of candidates according to the order of the ranking list. In the case of placement in more than one classification, the candidate will have to opt a single PhD program and a single scholarschip, with a written notice.

Article 6 - Course enrollment

1. The registrations of the winners must be validly completed without delay by **10 February 2023**. The operating procedures and the procedures for enrollment in the PhD course will be disclosed with a specific notice at the address http://www.unirc.it/ricerca/scuola_dottorato.php together with the publication of the Decrees approving the deeds.
2. Failure to enroll within the deadline referred to in paragraph 1 entails forfeiture of placement in the ranking and determines the scrolling of the same in favor of the first suitable candidate, according to the order established by the ranking.

Article 7 – PhD Scholarships

1. The PhD scholarships are awarded to the candidates usefully placed in the ranking with the methods set out in art. 4 paragraph 10.
2. The PhD scholarships cannot be combined with other scholarships awarded for any purpose, except with those awarded by national or foreign institutions to integrate, where appropriate, with stays abroad, training or research activities.
3. The recipients of scholarship **are not allowed** to have any other income from any other source that can lead to the loss of unemployment or inactivity, as defined in art. 4 paragraph a) of Legislative Decree n. 181 of 21.04.2000 as amended by Legislative Decree no. 297 of 19.12.2002, relating to the definition of the threshold

of annual income which has to be maintained throughout the duration of the scholarship, under penalty of forfeiture and refund of the installments received.

4. PhD scholarships are **incompatible**, under penalty of forfeiture of the enjoyment of the same and with the obligation to return the payments received, with:
   a) employees, including temporary ones, except for the possibility that the employee is placed by the employer on leave without pay;
   b) industry and commerce activities;
   c) contracts with the Università degli Studi Mediterranea di Reggio Calabria for whatever reason except the ones related to tutorial activities;
   d) any other activity that requires the opening of a VAT.
5. The payment of the PhD scholarship is linked to the periods of attendance and study and research activities actually carried out
6. The scholarships have a total duration of three years and are renewed annually, provided that the PhD student has completed the program of planned activities for the previous year and verified according to the procedures established by the PhD Board, with the obligation to disburse the scholarship following the passing of the verification.
7. The annual amount of the scholarship for attending PhD courses is restated, by Ministerial Decree no. 247 of 23 February 2022, in € 16,243.00 gross of social security charges to be paid by the recipient. This amount is increased to the maximum extent in place by 50% for a total period abroad not exceeding 12 months, if the PhD student is authorized by the PhD Board, which will take into account the objectives of the research projects to which the PhD scholarship relates.
8. All PhD scholarships announced as part of the Tech4You Innovation Ecosystem project fall into the category of doctoral programs with an industrial connotation. Therefore, the doctoral student will be required to carry out part of the research activities at a specially selected company taking into account both the thematic scope of the doctoral scholarship and, in general, the objectives of the research project.
9. Each PhD student is assured, in addition to the scholarship and within the financial resources existing in the budget, a budget for the research activity in Italy and abroad, adequate for the type of PhD program and in any case of an amount not less than 10% of the amount of the scholarship itself.
10. The one who has already received a scholarship for a PhD course, even for a single year or part of it, is not eligible for a second time.

Article 10 - Obligations

1. The admission to the PhD course implies an exclusive and full-time commitment.
2. All PhD students are obliged to attend all the teaching and training activities envisaged by the PhD program for its entire duration in the manner and within the times established by the Academic PhD Board gaining all credits provided for in the training plan prepared by the Board.
3. At the end of each year of the Course, PhD students are required to submit a detailed report on the training and research activities carried out, on the basis of which the Academic PhD Board will recognize the actual acquisition of credits envisaged by the training plan and will express an evaluation of merit, arranging for admission to the following year.
4. At the end of the third year of the Course, PhD students are required to submit a detailed report on the training and research activities carried out over the three-year period and the draft of the thesis giving the structure and contents of it, on the basis of which the Academic Board recognizes the actual acquisition of the expected credits from the training plan and expresses an evaluation of merit, arranging the submission of the thesis, to the Evaluators.
5. The insufficient number of credits acquired and / or the negative evaluation leads to the forfeiture of the PhD program with loss of any scholarship and repayment of the installments received in the current year.
6. PhD students also have the obligation to produce the documentation required by the funding institution (MUR) as provided in the specific guidelines.

7. In addition to the obligations envisaged for doctoral students set out in the University Regulations on Research Doctorates, the winners of a Doctoral scholarship associated with PNRR research projects undertake to:
   - ensure compliance with the obligations regarding communication and information provided for by art. 34 of Regulation (EU) 2021/241, indicating in all the documentation that the Program is financed under the PNRR, with explicit reference to the funding by the European Union and to the NextGenerationEU initiative, reporting in the documentation the emblem of the European Union and provide adequate dissemination and promotion of the Programme, including online, both web and social, in line with the provisions of the PNRR Communication Strategy;
   - comply with the principle of not causing significant damage to environmental objectives, pursuant to article 17 of Regulation (EU) 2020/852.
   - carry out the doctoral program in accordance with the research project foreseen for each PNRR intervention financed by the MUR.
8. All PhD students receiving a scholarship for each year of attendance are required to pay the relative contributions as specified below:
   - **by November 30** of each year of Course: € 281,29 (first instalment of € 265,29 + virtual stamp duty of € 16,00) + regional tax for university education referred to in art. 6, paragraph a) point 3;
   - by **June 30** of each year of Course: second instalment fee that will be determined based on the ISEE (Equivalent Economic Situation Indicator) with the wording "*si applica alle prestazioni agevolate per il diritto allo studio universitario*" for your own Tax Code, as stated on art. 4 paragraph 1 Table B of the University Regulations for Student Contribution. PhD students who, during the online enrollment or registration phase, do not enter the identification details of the ISEE certificate issued by INPS and do not activate the checkbox that authorizes the University to collect the related data directly from the INPS database, will be automatically placed in the highest range.

Article 11 – Doctorate Degree - Qualification

1. The title of Doctor of Research, abbreviated with the words: "Dott. Ric." or "Ph.D.", is released as a result of the positive evaluation of a research thesis that contributes to the advancement of knowledge or methodologies in the field of investigation chosen.
2. To be admitted to the final examination for the award of degree of Doctor of Research, the PhD student must have earned the credits provided by the training plan prepared by the Board of the PhD.
3. The PhD thesis, accompanied by a summary in Italian and English, is written in Italian or English or in another language by authority received of the PhD Board. The thesis, with a report on the activities of the student in the course of the PhD and eventual publications, shall be assessed by at least two highly qualified teachers, including those belonging to foreign institutions in the cases under art. 16 of the Rules of University's doctoral research, external to the parties that contributed to the release of the title of PhD, hereinafter referred to as Evaluators.
4. The public discussion takes place before a Commission whose composition is defined by the Regulations of PhD programs of Mediterranea University, within the six months immediately following the expiry date of the PhD course. At the end of the discussion, the thesis, with a reasoned written collegial judgment, is approved or rejected. The Commission, by unanimous vote, has the right to assign praises in the presence of results of particular scientific importance. The title of Doctor of Research is conferred by the Rector and upon a successful completion of the final exam.
5. The University will deposit the digital copy of the thesis in the ministerial database and then it will send a copy to the National Libraries of Rome and Florence.
6. The original parchment will be issued by the Mediterranean University of Reggio Calabria in a single copy, upon request of the interested party.

Article 12 - Treatment of personal data

1. The Università degli Studi Mediterranea di Reggio Calabria in the accomplishment of Decree n° 196/2003 "Code concerning the protection of personal data", agrees to use the personal data supplied by the candidate to carry out the examination procedures and for institutional purposes. Participation in the competition implies the principles set out in the Law concerning tacit consent to the publication of the personal data of the candidates on the website of the Università degli Studi Mediterranea di Reggio Calabria.

Article 13 - Advertising

1. For matters not covered in this call, please refer to the italian laws and regulations governing Research and PhD.
2. This call will be published on the website of the University of Studi Reggio Calabria (http://www.unirc.it/ateneo/albo.php) in the area dedicated to the Doctoral School (http://www.unirc.it/ricerca/scuola_dottorato.php), on the corporate website of the European Union EURAXESS (http://ec.europa.eu/euraxess) and on the website of the Ministry (https://ateneo.cineca.it/bandi/).

Annex A

FORM N. 1

PHD PROGRAM IN ARCHITECTURE		
Cycle	**XXXVIII**	
Curricula	**1. Architecture: Theory and Design** **2. Urban Regeneration**	
Duration	**3 Years**	
Coordinator	**Prof. Concetta Fallanca**	
Department	**Heritage-Architecture-Urbanism (PAU)**	
Degree Qualification requested according to Italian classification	All the old system degrees, the specialist ones (new system) and equivalent ones for foreigners, allow admission from a formal point of view. Coming from degree courses in the "Architecture and Building Engineering" class allows for a total overlap between the minimum knowledge required and the educational objectives of the doctoral course. For foreign graduates: Master degree.	
Documents to attach to the application	1. Signed application form for admission to the selection procedure, printed from the online procedure; 2. Research project **(Annex B)**; 3. Curriculum Vitae in European format; 4. Receipt of the payment of fee of € 65.00 (no refundable); 5. Self-declaration of the degree pursuant to D.P.R. 445 of 28 December 2000; 6. A copy of a valid identification document bearing the signed by the applicant;	
ADMISSION INTERVIEW		
Date and time	**16 january 2023 at 9:00**	
Method	**On-line**	
INVESTMENT	**EI TECH4YOU**	**CUP C33C22000290006**
SCHOLARSHIPS	**n. 3 Scholarships funded by EI Tech4you Spoke 4 Goal 4.7/PP1**	
EI TECH4YOU SPOKE 4 GOAL 4.7/PP1	**Open platform "phigital space" (physical and digital) of the type "user profiling" for the advanced and dynamic codesign of interventions on the built and ex novo**	
Title Scholarship n.1	**Remote sensing techniques and in situ investigations for the characterization of the structural types of historic buildings.**	
Description of the research project	The Calabrian territory is characterized by the presence of small villages and historic centres that are custodians of history and tradition and therefore worthy of enhancement and conservation. The management of such a peculiar and widespread building heritage also entails the need to ensure its usability in safety. This implies the need to predict the response of buildings even during extreme events, such as an earthquake, and therefore to highlight any structural criticalities that can only be highlighted through a detailed survey of the typological structural characteristics. The knowledge of the territory, of the building that characterizes it and of its structural fragility allows in fact public/private interventions aimed to its securing. The aim of the research is to develop a quick methodology for the	

	structural typological characterization of the urban buildings of historic centres through the use of technologically advanced methods, to be combined with traditional methods. Where possible, the acquired knowledge will allow the definition of structural safety maps to which regional administrations can refer for management and territorial planning purposes. The proposed methodology implies a drastic speeding up of the cataloguing processes of the historical built heritage, through advanced remote sensing techniques that allow real-time checks of the model results to be transferred to a database that is perfectly integrated and interactive with the digital platform envisaged in the project TECH4YOU SPOKE _4_ GOAL 7_ PP _1. Sharing the risk maps of an historic centre on the *open profile* platform is the basis of every planning strategy for both preventive (risk mitigation) and reactive (emergency management, evacuation plans).
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.2	**Direct methods of numerical analysis for the prediction of mechanisms and collapse load of historical buildings.**
Description of the research project	Italy possesses one of the largest cultural heritages in the world, part of which consists of its historical buildings distributed almost homogeneously throughout the Country. It therefore appears evident that the safeguarding, enhancement and safety of this heritage constitutes a strategic objective both in order to pass on the cultural heritage unaltered to future generations and in order to increase the tourist attraction capacity of some places otherwise destined for abandonment. Knowledge of the collapse mechanisms and the limit load of a historic building is of fundamental importance to identify any critical issues and therefore provide information on its safe usability. The research project aims to develop a numerical methodology of general applicability for the prediction of the collapse mechanisms and the limit load of historical buildings of different structural types. The aforementioned methodology involves the development of a predictive model, characterized by a systematic implementation of numerical procedures of direct analysis (limit analysis) that take into account the different constitutive behaviours of the materials present in the buildings under investigation. The systematization and implementation of these procedures, already developed in the literature in other areas, will allow the application of direct methods on historical constructions. The proposed approach has all the advantages of the predictive methods of numerical simulation essentially linked to the non-need for expensive experimental and / or in situ tests, with evident benefits on the costs necessary to obtain information on the possible damaging mechanisms and on the interventions to be implemented. All the results of the numerical analyses will be made available to the TECH4YOU SPOKE _4_ GOAL 7_ PP _1 project, contributing to the population of the open platform which is one of the main objectives of the entire project.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.3	**Safety assessment of historic masonry buildings with uncertain mechanical properties**
Description of the research project	Safety assessment of historic masonry buildings is critical to plan maintenance and strengthening interventions, especially in areas of high seismic risk. In this context, the mechanical characterization of masonry plays a crucial role. The

	results of experimental tests show a significant scattering of mechanical properties even for the same type of masonry. To obtain reliable estimates of the safety level of masonry buildings, therefore, the inherently uncertain nature of the relevant mechanical properties has to be taken into account. The probabilistic characterization of uncertain properties requires a large number of experimental tests, which are expensive and often incompatible with the need to preserve existing structures. For this reason, modern structural codes often provide typical ranges of values for compression and shear strength as well as for elastic and shear modulus of the most common types of masonry. The objective of this research project is to study the influence of uncertain mechanical properties on the safety level of historic masonry buildings. In view of the limitations of traditional probabilistic approaches in cases where a large amount of experimental data is not available, the mechanical properties of masonry will be described by means of the interval model. This model requires only knowledge of the possible range of variability of the uncertain parameters, consistently with the information provided by current standards for various types of masonry. In the presence of mechanical properties modelled as interval variables, the aim of structural safety assessment is to determine the corresponding interval of the probability of success (or crisis), representative of structural performance.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**

SCHEDA N. 2

PHD PROGRAM IN CIVIL, ENVIRONMENTAL AND INDUSTRIAL ENGINEERING	
Cycle	**XXXVIII**
Curricula	**1. Energy production from renewable sources** **2. Natural, environmental and anthropogenic risks** **3. Sustainable and resilient infrastructures and structures** **4. Processes, technologies and materials for the ecological transition**
Duration	**3 Years**
Coordinator	**Prof. Matilde Pietrafesa**
Department	**Civil, Energy, Environment and Materials Engineering (DICEAM)**
Degree Qualification requested according to Italian classification	LM-17 Fisica LM-20 Ingegneria aerospaziale e astronautica LM-21 Ingegneria biomedica LM-22 Ingegneria chimica LM-23 Ingegneria civile LM-24 Ingegneria dei sistemi edilizi LM-25 Ingegneria dell'automazione LM-26 Ingegneria della sicurezza LM-28 Ingegneria elettrica LM-30 Ingegneria energetica e nucleare LM-31 Ingegneria gestionale LM-33 Ingegneria meccanica LM-34 Ingegneria navale LM-35 Ingegneria per l'ambiente e il territorio LM-40 Matematica LM-53 Scienza e ingegneria dei materiali LM-54 Scienze chimiche LM-71 Scienze e tecnologie della chimica industriale LM-74 Scienze e tecnologie geologiche LM-75 Scienze e tecnologie per l'ambiente e il territorio LM Sc. Mat. Scienze dei materiali LM-53. Ingegneria dei materiali LM -4 Architettura e ingegneria edile-architettura LM-18 Informatica LM-27 Ingegneria delle telecomunicazioni LM-29 Ingegneria elettronica LM-32 Ingegneria informatica LM-48 Pianificazione territoriale urbanistica e ambientale 4/S Architettura e ingegneria edile 23/S (specialistiche in informatica) 30/S (specialistiche in ingegneria delle telecomunicazioni) 32/S (specialistiche in ingegneria elettronica) 35/S (specialistiche in ingegneria informatica) 50/S (specialistiche in modellistica matematico-fisica per l'ingegneria) 54/S Pianificazione territoriale urbanistica e ambientale 20/S (specialistiche in fisica)

	26/S (specialistiche in ingegneria biomedica) 27/S (specialistiche in ingegneria chimica) 28/S (specialistiche in ingegneria civile) 29/S (specialistiche in ingegneria dell'automazione) 31/S (specialistiche in ingegneria elettrica) 33/S (specialistiche in ingegneria energetica e nucleare) 34/S (specialistiche in ingegneria gestionale) 36/S (specialistiche in ingegneria meccanica) 37/S (specialistiche in ingegneria navale) 38/S (specialistiche in ingegneria per l'ambiente e il territorio) 45/S (specialistiche in matematica) 61/S (specialistiche in scienza e ingegneria dei materiali) 62/S (specialistiche in scienze chimiche) 81/S (specialistiche in scienze e tecnologie della chimica industriale) 82/S (specialistiche in scienze e tecnologie per l'ambiente e il territorio)
Documents to attach to the application	1. Signed application form for admission to the selection procedure, printed from the online procedure; 2. Research project **(Annex B);** 3. Curriculum Vitae in European format; 4. Receipt of the payment of fee of € 65.00 (no refundable); 5. Self-declaration of the degree pursuant to D.P.R. 445 of 28 December 2000; 6. A copy of a valid identification document bearing the signed by the applicant;
ADMISSION INTERVIEW	
Date and time	**17 gennaio 2023 at 9.00**
Method	**On-line**
INVESTMENT	**EI TECH4YOU** **CN SUSTAINABLE MOBILITY** — **CUP C33C22000290006** **CUP C33C22000240001**
SCHOLARSHIPS	**n. 6 Scholarships positions:** **- n. 3 Scholarships funded by EI Tech4you Spoke 4 Goal 4.7/PP1** **- n. 1 Scholarships funded by CN- MS Spoke 4 Railway** **- n. 2 Scholarships funded by EI Tech4you Spoke 4 Goal 4.6/PP1**
EI TECH4YOU SPOKE 4 GOAL 4.7 /PP1	**Open platform "phigital space" (physical and digital) of the type "user-profiling" for the advanced and dynamic codesign of interventions on the built and ex novo.**
Title Scholarship n.1	**Locally resonant composite metamaterial foundation systems for seismic isolation of masonry structures**
Theme to be developed	The research activity will aim to develop locally resonant composite metamaterial foundation systems for seismic isolation of masonry structures. The foundation system will consist of a periodic array of different layers, each coupled with external spring-mass resonators; it will be conceived and designed to attenuate, thanks to periodicity and local resonance induced by the resonators, the propagation of elastic waves caused by ground motion. Different materials/arrangements for the layers of the composite metamaterial and different types of external resonators, with one or multiple degrees of freedom, will be investigated. The research activity will involve developing analytical and computational models, demonstration of technical feasibility via computational analyses, realization of scaled prototypes, dynamic

	identification of prototypes in laboratory, experimental validation on scaled masonry structures in operational environment and, specifically, on a shaking table considering real earthquake records of various intensities.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.2	**Inerter-based devices for seismic protection of masonry structures**
Theme to be developed	The research activity will aim to develop inerter-based devices for seismic protection of masonry structures. The inerter is a two-terminal mechanical device, recently introduced for structural engineering applications, capable of providing large inertia forces as a result of a relative acceleration between the two terminals. The research activity will study inerter-based devices including an inerter, elastic springs and viscous dahpots, with the aim of reducing seismic-induced vibrations in masonry structures, with focus on buildings. Different potential arrangements of inerter, elastic springs and viscous dashpots will be considered for design, in series or in parallel. Active control mechanisms will be studied, to modify/tune the parameters of the inerter according to the time evolution of the fundamental parameters (mass/stiffness) of the structure to be protected. Two alternative strategies will be investigated: using the inerter-based device to connect two stories of the structure or to connect the first story with ground. The activities will involve developing analytical and computational models, demonstration of technical feasibility via computational analyses, realization of scaled prototypes, dynamic identification of prototypes in laboratory, experimental validation on scaled masonry structures in operational environment and, specifically, on a shaking table considering real earthquake records of various intensities.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.3	**Structural vulnerability and risk assessment for existing buildings subjected to different hazards**
Theme to be developed	The aim of the project is to develop tools for assessing the structural vulnerability and time-variant risk of the existing buildings in the Grecanic area. In the study, different temporal and spatial scales will be considered and both simplified (e.g., structural vulnerabilities for structural types) and detailed structural analyzes will be carried out (e.g., finite element models of individual buildings). Through a multi-hazard approach, seismic and hydro-geologic actions will be considered and the corresponding structural vulnerabilities will be assessed, identifying possible actions to reduce vulnerability and / or to mitigate risk. Moreover, various climate scenarios will be examined, evaluating their effects on the developed vulnerability models. Referring to the seismic risk, the vulnerability models will be able to take into account the possible damage accumulation during seismic sequences; i.e., they will be applicable to different time scales. About the hydro-geological hazard, the areas with a significant potential flood risk current or future due to climate change will be identified. The flood risk analysis will be carried out using hydraulic-hydrological modeling and will be preceded by an assessment of potential risks, estimated with respect to recorded data, rapid analyzes and climate change effects. This preliminary phase will be followed by detailed studies where historical events will be used to calibrate the models. Flood damage will be defined as the sum of all possible negative impacts of a flood on exposed elements, such as people, infrastructure, economic activities, cultural heritage. The actions carried out for the prevention and mitigation of the risk will be addressed to the reduction of the expected damage following natural events.

Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
CN -MS -SPOKE 4	**RAILWAY**
Title Scholarship n.4	**Sustainable solutions for construction and maintenance of railway**
Theme to be developed	The research focuses on the pursuit of sustainability objectives in defining construction and maintenance strategies of railway infrastructures, to promote decarbonisation and lower energy requirements in a life cycle perspective. In this context, the research project will develop the comparison of different types of materials, traditional and innovative, and different track solutions (ballast or ballastless) based on performance (eg Key Performance Indicators, KPI) and / or integrative approaches (eg Life Cycle Costing, LCC and Reliability Availability, Maintainability, Safety, RAMS). The research activities are framed within the objectives of Spoke 4 Railway of the National Center Sustainable Mobility (CNMS) of which the University Mediterranea of Reggio Calabria is a partner, as an affiliated body. The design studies also include testing phases carried out in collaboration with other academic/industrial partners involved in the Spoke.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
EI TECH4YOU SPOKE 4 GOAL 4.6/PP1	**Spoke 4: Safeguarding and enhancing the natural, cultural heritage and identity of the territories** **Goal 6 -Planning for climate change to booster cultural and natural heritage: demand-oriented ecosystem services based on enabling ict and AI technologies**
Title Scholarship n.5	**AI and GIS Digital Twin models for governing climate change interactions on cultural and natural heritage and on ecosystem services integrated into WebGIS platforms**
Theme to be developed	The research contribution will concern the definition and computer development of innovative AI algorithms and emerging properties within a 3D WebGIS platform to be built with open source technologies (such as Cesium, PostgreSQL, PostGIS, Java, Geoserver, SQL) with stubbing interfaces to Matlab, R, Python. Model instances should operate within the GIS environment and offer a phenomenological representation of the Digital Twin type. The processing of the models operating on post-processed data of various types (Orographic, Remote Sensing, Spatial Surveys, IOT Real time, Climatic Weather, etc.) shall provide output forecasts and analyses for decision support in the context of the research in question, with particular reference to the control and management of the interactions produced by climate change on the cultural and natural heritage and on ecosystem services. Innovative technologies for distributing the computational load in HPC (high performance computing) mode with hybrid clustering technologies: Server, Workstation, GPU, FPGA will be tested. At the same time, the layout of the infrastructure (net of computational requirements) will have to be compatible with embedded systems, especially on the GIS services side. Of particular importance is the search for an abstract formalism, as generic as possible, capable of integrating in Plugin mode any AI model and emerging properties

	within the WebGIS platform, and to make the processing usable both on the appropriate User Interface and as a consumable service via OGC standards. The research activities are framed in Spoke 4 of the Tech4You Project: Safeguarding and valorising the natural and cultural heritage and identity of territories.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.6	**Analysis and Data Geoprocessing in GIS Environment for AI and Emerging Properties Models**
Theme to be developed	The contribution of the research will concern the definition and application of innovative methodologies in the field of GIS Analysis oriented to the construction of information layers useful for the representation of spatial pertinences by means of Digital Twin type representations. In particular, a processing pipeline will have to be created with GIS and Remote Sensing tools functional to data processing and data assimilation for the modelling of different spatial units through AI algorithms and simulators with emerging properties. The processing methodology must have connotations inherent to the application field in which the models operate (impact of climate change on the cultural and natural heritage and ecosystem services), in order to improve processing performance and forecast quality. Data assimilation will have to operate on varied sources and find the best ways to congruently integrate their information content into the models and thus into the dedicated GIS platform. The different types of data (data from the historical catalogue, from large-scale models, from RS pipelines, from Third Party Services, from IOT / Real Time surveys, etc.) will have to be ingested both directly and downstream of geoprocessing (Spatial, Statistical, Downscaling) governed by computational processes consonant with the governance of the impact of climate change on ecosystem services. The research activities are framed by Spoke 4 of the Tech4You Project: Safeguarding and enhancing the natural and cultural heritage and identity of territories.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**

FORM N. 3

PHD PROGRAM IN INFORMATION ENGINEERING	
Cycle	**XXXVIII**
Curricula	= = = =
Duration	**3 anni**
Coordinator	**Prof. Antonella Molinaro**
Department	**Information Engineering, Infrastructure and Sustainable Energy (DIIES)**
Degree Qualification requested according to Italian classification	LM-17 Fisica LM-18 Informatica LM-20 Ingegneria aerospaziale e astronautica LM-21 Ingegneria biomedica LM-22 Ingegneria chimica LM-23 Ingegneria civile LM-24 Ingegneria dei sistemi edilizi LM-25 Ingegneria dell'automazione LM-26 Ingegneria della sicurezza LM-27 Ingegneria delle telecomunicazioni LM-28 Ingegneria elettrica LM-29 Ingegneria elettronica LM-30 Ingegneria energetica e nucleare LM-31 Ingegneria gestionale LM-32 Ingegneria informatica LM-33 Ingegneria meccanica LM-34 Ingegneria navale LM-35 Ingegneria per l'ambiente e il territorio LM-40 Matematica LM-44 Modellistica matematico-fisica per l'ingegneria LM-53 Scienza e ingegneria dei materiali LM-54 Scienze chimiche LM-66 Sicurezza informatica LM-70 Scienze e tecnologie alimentari LM-71 Scienze e tecnologie della chimica industriale 20/S (specialistiche in fisica) 23/S (specialistiche in informatica) 25/S (specialistiche in ingegneria aerospaziale e astronautica) 26/S (specialistiche in ingegneria biomedica) 27/S (specialistiche in ingegneria chimica) 28/S (specialistiche in ingegneria civile) 29/S (specialistiche in ingegneria dell'automazione) 30/S (specialistiche in ingegneria delle telecomunicazioni) 31/S (specialistiche in ingegneria elettrica) 32/S (specialistiche in ingegneria elettronica) 33/S (specialistiche in ingegneria energetica e nucleare) 34/S (specialistiche in ingegneria gestionale) 35/S (specialistiche in ingegneria informatica) 36/S (specialistiche in ingegneria meccanica) 37/S (specialistiche in ingegneria navale)

	38/S (specialistiche in ingegneria per l'ambiente e il territorio) 45/S (specialistiche in matematica) 50/S (specialistiche in modellistica matematico-fisica per l'ingegneria) 62/S (specialistiche in scienze chimiche) 78/S (specialistiche in scienze e tecnologie agroalimentari) 81/S (specialistiche in scienze e tecnologie della chimica industriale) For foreign candidates: Qualifications equivalent to the required degrees	
Documents to attach to the application	1. Signed application form for admission to the selection procedure, printed from the online procedure; 2. Research project **(Annex B);** 3. Curriculum Vitae in European format; 4. Receipt of the payment of fee of € 65.00 (no refundable); 5. Self-declaration of the degree pursuant to D.P.R. 445 of 28 December 2000; 6. A copy of a valid identification document bearing the signed by the applicant;	
INVESTMENT	**EXTENDED PARTNERSHIPS N.14 "RESTART"**	**CUP C37G22000480001**
ADMISSION INTERVIEW		
Date and time	**18 January 2023 at 9.00**	
Modalità	**On-line**	
SCHOLARSHIPS	**n. 13 Scholarships positions:** - **n. 1 scholarships funded by Spoke 1 Focused Project F5 GrapHICS** - **n. 2 scholarships funded by Spoke 2 Structural Project S11 "Integrated Terrestrial and non-Terrestrial Networks"** - **n. 4 scholarships funded by Spoke 4 Structural Project S2 "Programmable networks"** - **n. 4 scholarships funded by Spoke 6 Structural Project S1 "Disruptive architectures and open platforms for network innovation"** - **n. 2 scholarships funded by Spoke 7 Structural Project S12 "Smart propagation environments"**	
SPOKE 1 FOCUSED PROJECT F5 Graphics	**Spoke 1 - "Pervasive and photonic network technologies and infrastructure" F5 - Graphics - Graphene/a-Si:H Photonic Integrated CircuitSwitch**	
Title Scholarship n.1	**Photonic Integrated Circuits for fiber-optic communications**	
Theme to be developed	Fiber-optic communications are necessary to meet the requirements of the 5th generation of wireless technology, known as 5G, driven by the constant development of the Internet of Things (IoT). In the past 20 years Silicon Photonics (SiPh) has emerged as the most attractive technology for realizing Photonic Integrated Circuits (PICs), leveraging the unrivaled maturity of silicon micro-electronics, thus opening up disruptive opportunities for very high yield and low cost PICs. Nonetheless, several points are still open before SiPh can reach full CMOS integrability.	

	The research topic will focus on the low-cost and low-thermal-budget technology of hydrogenated amorphous Silicon (a-Si:H) in conjunction with the excellent electro-optical properties of Graphene (Gr) to demonstrate a novel and fully CMOS-compatible photonic platform that can be realized with a back-end technological process. In particular, the overall objective is to develop the first-time-ever monolithic convergence between an all-optical switch and a low-power microchip, performing all the necessary control functions, within the same PIC. Besides the specific application in fibre-based telecommunications, the proposed technology, based on the low-cost thin-film of Gr as an active layer between silicon on CMOS, will also enable the conceiving of new optoelectronic devices deployable in other fields, like aerospace, biomedicine, or for on-chip communications.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
SPOKE 2 STRUCTURAL PROJECT S11	**SPOKE 2 – INTEGRATION OF NETWORKS AND SERVICES S11 "INTEGRATED TERRESTRIAL AND NON-TERRESTRIAL NETWORKS"**
Title Scholarship n.2	**Edge-cloud computing solutions for integrated Terrestrial/Non Terrestrial networks**
Theme to be developed	Future integrated Terrestrial/Non-Terrestrial (T/NT) networks, where space network entities (unmanned aerial vehicles - UAVs, aircrafts, high-altitude platforms - HAPS, and Geostationary and non-Geostationary satellites) cooperate with conventional and emerging terrestrial communication architectures, represent a key solution to provide ubiquitous, resilient, and three-dimensional wireless connectivity around the world, supporting Mobile Broadband Reliable Low Latency Communications, massive Ultra Low Latency Communications, and Human-Centric Services. The resulting network will improve coverage, user experience, system capacity, service reliability and availability, and environmental sustainability of next generation communication infrastructure for many verticals: transport, security, public safety, media, entertainment, eHealth, energy, agriculture, finance, automotive, etc. Furthermore, it can provide high-speed connectivity in remote sites or in disaster-affected areas. In such a context, the proposed research addresses the investigation, design and development of solutions based on edge-cloud computing designed for T/NT networks aimed at supporting heterogeneous services with diverse application requirements.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.3	**Automated allocation strategies of 3C resources for integrated T/NT networks**
Theme to be developed	A key solution to provide ubiquitous, resilient, and three-dimensional wireless connectivity around the world is represented by future integrated Terrestrial/Non-Terrestrial (T/NT) networks, where space network entities (unmanned aerial vehicles - UAV, aircrafts, high-altitude platforms - HAPS, and Geostationary and non-Geostationary satellites) cooperate with conventional and emerging terrestrial network architectures for the delivery of heterogeneous

	traffic types with diverse requirements. The foreseen integration will enable improved network coverage, user experience, system capacity, service reliability and availability, and environmental sustainability of next generation communication infrastructure, with consequent benefits for a wide range of verticals, such as transport, security, public safety, media, entertainment, eHealth, energy, agriculture, finance, automotive. Moreover, the resulting network will enable the delivery of high-speed connectivity in remote areas or in disaster-affected scenarios. In the envisioned scenario, the proposed research focuses of the analysis, design and development of automated allocation strategies of computing, communication, and caching resources (3C) and seamless cooperation of terrestrial/aerial/satellite nodes.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
SPOKE 4 STRUCTURAL PROJECT S2	**SPOKE 4 – Programmable Networks for Future Services and Media S2 "Programmable Networks"**
Title Scholarship n.4	**Dynamic Software Edge-mobile Platform**
Theme to be developed	The research takes the challenges posed by a sustainable digitalization and conceives an innovative, fully distributed ecosystem spanning from the cloud to IoT/mobile devices, where computing/network resources and data in different domains of the **cloud-to-things continuum** all synergically contribute to realizing critical services. The reasons for processing critical services at the edge of the network-compute continuum are multifold, including reliability, latency, data volume and data sovereignty. The research will focus on the design and development of a **software edge platform** that is modular, open and scalable and ensures critical service provisioning while satisfying the target requirements of quality of service and sustainability. The goal is to provide the **architectural solutions and protocols to manage virtualised resources in the device-edge-cloud continuum in a dynamic and seamless way**. The main focus will be on evolutions of current network function virtualization approaches, and extending them to the very dynamic environment where microservices can be dynamically (re-)deployed at edge and mobile devices. The platform will use **lightweight** solutions to guarantee minimal overheads, and awareness of resource consumption of devices will also be taken into account. Moreover, the research investigates distributed configuration solutions leveraging **cooperation between mobile/IoT devices and edge**.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.5	**Open Framework for the Programming and Deployment of Network and Application Functions**
Theme to be developed	Designing future telecommunication networks takes the challenges posed by a sustainable digitalization to conceive an innovative, fully distributed ecosystem spanning from the cloud to IoT/mobile devices, where computing/network resources and data in different domains of the cloud-to-things continuum all

	synergically contribute to realizing critical services to end users. This objective cannot be fulfilled without the development of a truly open programmable network that could accelerate the digital transformation of a wide range of vertical industries, thus contributing to many societal benefits, by enabling cloud-native solutions integrated with 5G/6G technologies closer to or onto the mobile service area. The research will focus on the development of an open programming framework that considers the programmability of both the Data and Control Planes of the network in the edge-cloud infrastructure. The former will take into account the heterogeneity of the composing Data Planes e will make it possible to write network functions that can be deployed over a wide range of platforms ranging from virtual switches to multigigabit routers. The latter will leverage a Software Defined Networking approach for the optimal deployment of chains of network and/or application functions with the objective to optimize traffic management through function composition/decomposition and deployment onto the best nodes in the continuum.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n. 6	**Automated Distributed Orchestration in Multi-tier Networks**
Theme to be developed	Emerging trends in beyond-5G and 6G networks go towards the holistic integration of mobile services, edge computing, and network programmability. In the so-called device-edge-cloud continuum, communication, storage and computing resources and services shall be seamlessly combined along the path from the IoT/mobile devices to the back-end clouds, passing through intermediary edge and fog nodes. The ambitious objective can be achieved only considering a holistic approach to the network-compute-storage infrastructure targeting common objectives (flexibility, agility, automation, energy consumption), in which a programmable network delivers highly-demanding and intelligent services. Focus of this research is to design and develop efficient models, methodologies and algorithms for automated end-to-end orchestration, chaining and migration of virtualized hyper-distributed services and network-compute-storage resources in the continuum. The research envisions data-driven mechanisms for decomposing services into micro-tasks and dispatch them to nodes in the multi-tier network, thus counteracting resource underutilization and ensuring horizontal scalability.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n. 7	**Sustainable Hyper-distributed Intelligent Service Support**
Theme to be developed	An aspect that raises unprecedented challenges to the network design is the presence, in many real-world vertical domains, of services based on distributed intelligence to support decision making, which require that increasing amounts of data, generated by massively deployed ubiquitous devices at the edge, are moved throughout the continuum to promptly build knowledge. Edge applications and services will be highly distributed across the computing, storage, and network continuum, from low-capability embedded devices to medium-capability edge nodes, up to high capability cloud servers. The required future edge solutions are envisioned to embrace emerging paradigms of distributed intelligent applications and services where data and machine learning (ML)

	models are produced and processed collaboratively across nodes in the device-edge-cloud continuum. Goal of this research is to create breakthrough cooperative algorithmic solutions to enable: (i) the deployment, configuration, chaining, and migration of pervasive, hyper-distributed intelligent services; (ii) optimal end-to-end resource orchestration across multiple network tiers, (iii) joint optimization and allocation of distributed intelligence, compute, storage, and network resources.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
SPOKE 6 STRUCTURAL PROJECT S1	**SPOKE 6 – Innovative Architectures And Extreme Environments S1 -Disruptive Architectures And Open Platforms for Network Innovation**
Title Scholarship n. 8	**Key Value Indicator (KVI)-driven innovative next-generation networking**
Theme to be developed	The project will develop and assess a disruptive network architecture based on the concept of Digital Twin (DT) suitably extended to meet the needs of future telecommunications. To assess such a type of network, besides traditional key performance indicators (KPIs), some Key Value Indicators (KVIs) have to be identified. The objective of the research will be to develop an innovative KVI-driven network management approach that starting from KVIs is able to define precise high-level "intents" that are then fed into an ecosystem of DTs to automatically drive their configuration. A set of key use-cases (UCs) will be identified and requirements for the selected UCs will be identified and expressed in terms of KPIs. A KVI-oriented network management approach will allow for the definition of KVIs of the different players involved, for the mapping of the KVIs into KPIs that can be used to fed the optimization procedures developed for a system of DTs that will emulate the network behaviour, to observe the impact before deploying the network. Proof-of-concepts (POCs) of the developed solutions are expected, which shall be defined so as to demonstrate breakthroughs in both technical and industrial perspectives, and to take full advantage of innovations introduced.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n. 9	**Digital Twins ecosystems for fifth and sixth generation networks**
Theme to be developed	A Network Digital Twin (NDT) is an emerging solution to implement a network model that mimics the physical network, taking as input a network state description (e.g., traffic, topology, routing, scheduling policies) and giving multiple types of output (e.g., time series, link-level predictions, global network level metrics, etc.). The aim of the research will be to contribute to the design and development of a distributed and open SW architecture based on Digital Twins (DTs), integrating data with different lifetimes, supporting Artificial Intelligence and quantitative analytics, and providing a SW interface for self-representation, monitoring, and control of networks components and subsystems (ie, an ecosystem of NDTs). Representation of DTs shall be designed so as to support dynamic behavior, with automated lifecycle management encompassing instantiation, interconnection, and deletion, and with mechanisms of discovery.

	Proof-of-concepts (POCs) of the developed solutions are expected, which shall be defined so as to demonstrate breakthroughs in both technical and industrial perspectives, and to take full advantage of innovations introduced.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n. 10	**Multi-level, federated orchestration of computing and communication resources in systems of Digital Twins**
Theme to be developed	An emerging paradigm in the context of 5G and 6G networks is that of Network Digital Twins (NDT). In line with several recent research and standardization efforts, according to this paradigm, all major entities involved in a network are assumed to have a digital counterpart, and the NDTs interact with each other and with the entities they model. An ecosystem of Digital Twins for networks needs novel orchestration methodologies and techniques, able to dynamically allocate and/or migrate computational and communication resources belonging to different DTs and supporting provisioning of complex end-to-end network services. The aim of the research is to address the design and development of innovative methods and algorithms for flexible and secure service orchestration (i.e., edge computing, digital service chains, service aggregation) in a hierarchical and distributed setting. The goal is to orchestrate computational and communication resources available in the cloud-to-device continuum, to allocate/migrate (dynamically and on-demand) network functions, node and network resources, and chains of digital services. Proof-of-concepts (POCs) of the developed solutions are expected, which shall be defined so as to demonstrate breakthroughs in both technical and industrial perspectives, and to take full advantage of innovations introduced.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n. 11	**Next-generation networks to support distributed intelligence**
Theme to be developed	Originally deployed in remote clouds only, Artificial Intelligence/Machine Learning (AI/ML) algorithms are going to pervasively spread across the Cloud-to-Device continuum to unlock a myriad of intelligent applications in different domains and for support the development of an ecosystem of Intelligent Digital Twins, i.e. Digital Twins (DTs) which implement learning algorithms and cooperate with other DTs to implement distributed learning applications. Such distributed AI approaches severely challenge existing networking solutions, due to massive data (datasets, models, etc.) to be exchanged for learning/inference purposes throughout heterogeneous nodes over the continuum, while satisfying latency, accuracy and privacy requirements. To address this challenge the aim of the research will be the development and assessment of innovative networking solutions enabling and supporting the transition from the mature paradigm of connected devices to the disruptive new paradigm of "connected distributed intelligence" characterizing upcoming 6G ecosystems. This will involve for example the design of policies to jointly orchestrate and manage computing, caching, and communication (3C) resources across the cloud-to-device continuum in order to optimize distributed AI/ML workloads, to share the existing (programmable) network infrastructure with

	other services, and to enforce mutual trustworthiness among involved intelligent DTs. Proof-of-concepts (POCs) of the developed solutions are expected, which shall be defined so as to demonstrate breakthroughs in both technical and industrial perspectives, and to take full advantage of innovations introduced.	
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**	
SPOKE 7 STRUCTURAL PROJECT S12	**SPOKE 7 – GREEN AND SMART ENVIRONMENT S12 "SMART PROPAGATION ENVIRONMENTS"**	
Title Scholarship n. 12	**Design and development of intelligent electromagnetic environments through the 'inverse design' of metasurfaces**	
Theme to be developed	The proposed project aims to determine how to locate and realize 'ad hoc' possibly reconfigurable electromagnetic devices by means of the 'inverse design' paradigm. In this latter, one aims to realize given specifications on the electromagnetic field (even just in terms of field amplitude) in a given environment, one wants to (slightly) modify it in such a way to realize the required electromagnetic field coverage. Specific research activities will concern the comprehension of physical limitations and an optimized synthesis of the (meta)surfaces at hand.	
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**	
Title Scholarship n. 13	**Design and development of intelligent electromagnetic environments through the synthesis of optimal location of primary sources and metasurfaces**	
Theme to be developed	The proposed project aims to determine how to locate and realize 'ad hoc' possibly reconfigurable electromagnetic devices by means of the 'inverse design' paradigm. In this latter, one aims to realize given specifications on the electromagnetic field (even just in terms of field amplitude) in a given environment, one wants to (slightly) modify it in such a way to realize the required electromagnetic field coverage. The specific PhD research activities will be aimed to develop methods for the optimal location of the metasurfaces at hand, as well as the comprehension of the actual advantages one can achieve.	
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**	
INVESTMENT	**NATIONAL CENTER FOR SUSTAINABLE MOBILITY CN-MS "MOST" EI TECH4YOU**	**CUP C33C22000240001 CUP C33C22000290006**
ADMISSION INTERVIEW		
Date and Time	**18 gennaio 2023 at 14:00**	
Method	**On-line**	
SCHOLARSHIPS	**n. 5 Scholarships positions**:	

	- n. 2 Scholarships funded by CN-MS "MOST" - Spoke 4 Rail Transportation **- n. 2 Scholarships funded by CN-MS "MOST" - Spoke 6 Connected and Autonomous Vehicles (CAVs)** **- n. 1 scholarships funded by EI TECH4YOU Spoke 2 Goal 2.5 PP1**
CN -MS "MOST" Spoke 4 Railway	**RAIL TRANSPORTATION**
Title Scholarship n.1	**Sustainable development of railway corridors: demand and supply models for railway services on High Speed Rail (HSR) networks.**
Theme to be developed	The research concerns the development of sustainable railway corridors. The research activities will focus on supply and demand models for railway services on networks with High Speed Rail (HSR) characteristics. The demand and supply models are parts of a general framework for the analysis of High Speed Rail (HSR) supply and demand aimed at pursuing sustainable development objectives in Southern Italy, in line with national planning objectives, the European TEN-T/RFC corridors and core port nodes. The research activities are consistent with the objectives of Spoke n.4 Rail Transportation of the National Centre for Sustainable Mobility of which the Mediterranean University of Reggio Calabria is a partner, as an affiliated institution.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.2	**Sustainable development of railway corridors: sustainable and smart tracks for High Speed Rail (HSR) networks.**
Theme to be developed	The research concerns the development of sustainable railway corridors. The research activities deal with sustainable and smart railway systems and particularly smart railway tracks. In more detail, it focuses on the following main topics: a) the analysis and the comparison, under UN-sustainable development goals and criteria, of the national and European standards and objectives for the conventional and High Speed Rail (HSR) networks; b) the analysis of railway track costs as a function of their typology; c) the analysis of smart solutions (e.g., sensing systems) applied to railway tracks, d) the verification of L.A.R.G. (Lean, Agile, Resilient, Green) paradigm; e) the study of High Speed Rail (HSR) solutions in Southern Italy. The research activities are consistent with the objectives of Spoke n.4 4 Rail Transportation of the National Centre for Sustainable Mobility MOST of which the Mediterranean University of Reggio Calabria is a partner, as an affiliated institution.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
CN MS "MOST" SPOKE 6 CAV	**CONNECTED AND AUTONOMOUS VEHICLES (CAVS)**
Title Scholarship n.3	**Innovative communication and computing technologies for Connected and Autonomous Vehicles**
Theme to be developed	In recent years, considerable research efforts have been made to develop autonomous vehicles. The main objective is to improve driving safety, reducing the number of road accidents (of which about 94% are due to driving errors) on

	the one hand, and reducing emissions and fuel consumption on the other. To make an autonomous vehicle, several interdisciplinary challenging issues have to be solved. In such a context, the proposed research addresses the investigation, design and development of innovative ICT solutions to support autonomous and connected vehicles. The research activities will be carried out within the Spoke No. 6, Connected and Autonomous Vehicles (CAVs) of the National Centre for Sustainable Mobility, in which the University Mediterranea of Reggio Calabria is an affiliated institution. In particular, they will focus on enhancements of technologies for the collection (e.g., via on-board sensors/biosensors), exchange (via Vehicle-to-Everything, V2X, communication) and processing (via machine learning ML, algorithms, also implemented in the 'edge' segment) of data about the vehicle itself, the driver as well as the surrounding environment useful to ensure safe, efficient and effective solutions for autonomous and connected driving. The project studies also foresee test phases using both simulation tools (network, mobility/driving) and off-the-shelf devices with advanced sensors/V2X connectivity/cognitive capabilities and edge computing platforms, also in collaboration with other academic/industrial partners involved in Spoke No. 6.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.4	**Connectivity, trajectory planning and control solutions for Cooperative Autonomous Vehicles**
Theme to be developed	Recently, huge technological advancements have been made to develop autonomous vehicles. The main target is to improve the driving safety as well as to reduce the carbon footprint for a more sustainable mobility. Several issues lie ahead to make autonomous vehicles a reality. Indeed, an autonomous vehicle has to account for information coming from the vehicle itself and the surrounding environment as well as (other vehicles and not only them) perceived through on-board sensors and by exchanging data through communication technologies, in order to plan its own trajectory and promptly and appropriately react to unexpected environmental changes or presence of obstacles. The proposed research will concern the design and deployment of innovative solutions to support autonomous cooperative vehicles. Research activities will be carried out within the Spoke No. 6, Connected and Autonomous Vehicles (CAVs) of the National Centre for Sustainable Mobility, in which the University Mediterranea of Reggio Calabria is an affiliated institution. Synergies will be investigated between Vehicle-to-Everything (V2X) communication technologies and techniques for trajectory planning and control algorithms (also cooperative), to guarantee solutions for safe, efficient and effective autonomous cooperative driving. The project studies also foresee test phases using both simulation tools (network, mobility/driving) and off-the-shelf devices with advanced sensors/V2X connectivity, also in collaboration with other academic/industrial partners involved in Spoke No. 6.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
EI TECH4YOU SPOKE 2 GOAL 2.5 PP1	**TECHNOLOGIES AND METHODOLOGIES TO SUPPORT PERVASIVE, ECO-FRIENDLY AND LOW-COST ENVIRONMENTAL MONITORING AND ECO-MOBILITY MANAGEMENT IN URBAN/SURBURBAN AREAS**

Title Scholarship n.5	**Collection and processing of Environmental Data from Moving Vehicles through Internet of Vehicles (IoV) and Edge computing.**	
Theme to be developed	The objective of the proposed research is the design and implementation of new technologies to collect, process and remotely transmit environmental data from moving vehicles. The use vehicles as mobile probes to monitor road congestion is a well know approach commonly referred as Floating Car Data. The novelty of the proposed research is the extension of Floating Car Data to monitor air pollution. The foreseen output of the research will consist in the design of a mobile gateway to be installed on board of the vehicles capable of: i) connecting to the sensing elements installed on the vehicle to collect relevant data, ii) either locally processing the collected data or offloading this operation to nearby Edge servers placed at the network borders, iii) transferring the processed data to the remote cloud for further processing and monitoring. The Issues to be solved to get the planned objectives will concern: i) the extreme heterogeneity of sensing elements which implies the coexistences of different communication protocols and different semantic in the data; ii) the opportunity to locally process the data or to offload their processing to the Edge requires the definition of some optimization criteria based on parameters such as local computing load and network congestion; iii) the intermittent nature of vehicular communications call for the definition of smart strategies to prioritize the transfer of the collected/processed data on the basis of their time validity.	
Period in enterprise	**Mandatory (6 Months)**	
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**	
INVESTMENT	**NATIONAL RESEARCH CENTRE FOR AGRICULTURAL TECHNOLOGIES EI TECH4YOU**	**CUP C33C22000260001 CUP C33C22000290006**
ADMISSION INTERVIEW		
Date and Time	**20 gennaio 2023 at 9:00**	
Method	**On-line**	
Scholarships	**n. 4 Scholarships positions**: **- n. 1 scholarships funded by CN Agritech Spoke 9 WP 9** **- n. 3 scholarships funded by EI TECH4YOU Spoke 3 Goal 4**	
CN AGRITECH SPOKE 9 WP 9.5	SPOKE 9 **New Technologies fnd Methodologies for Traceability, Quality, Safety, Measurements and Certifications to enhance and Protect Typical Products in the Agri-Food Supply Chains W P 9.5 WOA Data Space Testing And Validation**	
Title Scholarship n.1	**Design and development of decision support systems**	
Theme to be developed	The candidate will be asked to deal with innovative computational approaches mainly based on Artificial (or Augmented) Intelligence methodologies focused to the development of intelligent decision support system. In particular, he/she will be asked to design, implement, and test some neural network architectures and algorithms for the manipulation of the data and metadata made available during the various tasks of the project. The main objective of the work to be developed by the doctoral candidate will be the extraction of suitable non-trivial information, in terms of features at the different levels of the "Agritech" chains. To do this, several approaches based on unsupervised learning methodologies (i.e., clustering data, autoencoding), supervised learning (i.e., classification,	

	prediction of time series, of causal relations from data and events), and semi-supervised learning methodologies (in which the data are only partially labelled, and one of the the goals will be to learn the labels of unlabelled data) will be studied and designed looking to the practical implementation on various levels of the AgriTech systems. The doctoral student will be also asked to develop some tests on experimental data, and the measure of the objectives' achievements will be given by the codes developed made available and the prototype related to sub-parts of the whole system. The analyzed design will also include the generation of additional "virtual" data through generative adversarial schemes (GAN), and the design and practical use of Graph Neural Networks to combine information gathered on the tasks at hand from other WPs, coping with unstructured data coming from various sources as well as metadata. As in these tasks, innovative computational approaches based on Artificial (or Augmented) Intelligence methodologies are advocated in the design of DSS, the candidate should be aware of the main machine/deep learning techniques, and the related software platform codes.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
EI TECH4YOU SPOKE 3 GOAL 4	**SMART FOOD INDUSTRY: VIRTUALIZATION, SENSING, IOT FOR ADVANCED TRACEABILITY**
Title Scholarship n.2	**Virtualization through 5G/6G ICT technologies for Agritech Smart factory platform**
Theme to be developed	Design and implementation of the functional modules of the ICT platform, investigating architectural solutions based on virtualization principles of the main functions of the platform and of the devices that make up the segment operating "on the ground", through integration of the Cloud and Fog Computing paradigms and through exploitation of typical paradigms deriving from the fields of IoT, Software Defined Networking (SDN) and Network Function Virtualization (NFV). The goal will be to develop functionalities to make the Agritech Smart factory platform quickly reconfigurable and adaptable to the various transformations or differentiations of the production processes that may be necessary within a company and also to specify the platform to make it suitable for different production areas in different food supply chains
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.3	**Agri-Food Chain Data Collection for Advanced Traceability and Certification**
Theme to be developed	Development of a fingerprint database of food quality, safety and authentication markers for integration into new generation and sustainable electronic devices (e.g. Smart-Tags) for advanced traceability and anti-counterfeiting. Another objective of the PhD is the development and/or integration of innovative sensors (IIOT) for the on-process monitoring of food product quality and safety markers in order to support the development of a functional module of an ICT platform for product certification guaranteed by specific algorithms, which operates in the

	"Agritech Smart factory" area. Data collection solutions from IOT devices will be implemented, and augmented with the use of Machine Learning / Deep Learning (ML/DL) methodologies for the extraction of multidimensional and multimodal characteristics on a data-driven basis, in distributed/federated contexts, using the database and suggesting, also through on-device learning, the necessary additions and growth with data augmentation techniques.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.4	**Development of low-cost micro-nano-electronic technologies for food applications**
Theme to be developed	The proposed research concerns the development of low-cost, self-powered and/or low power consumption micro- and nano-electronic technologies for the collection, storage and processing of fingerprints of quality, security and authentication markers of foods. The technologies in question will provide for the integration on a micro and nano-scale of technologies such as IoT and artificial intelligence systems, based on Machine Learning/Deep Learning (ML / DL) methodologies integrated in devices with reduced computational capacity, using existing communication protocols such as RFiD, WiFi, BLE. The research also intends to integrate the aforementioned proposed technologies with innovative sensors, adapting existing techniques or developing new ones. The power supply of the devices will possibly make use of Wireless Power Transfer techniques, trying to overcome the limitations due to the small size and consumption.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**

SCHEDA N. 4

PHD PROGRAM AGRICULTURAL, FOOD AND FORESTRY SCIENCE	
Cycle	**XXXVIII**
Curricula	**1. Agricultural production sciences** **2. Food science and technology** **3. Forest sciences**
Duration	**3 years**
Coordinator	**Prof. Leonardo Schena**
Department	**Agraria**
Scholarships	**n. 8 PhD positions**: **- n. 3 scholarships funded by EI TECH4YOU Spoke 3 Goal 1 PP1** **- n. 1 scholarship funded by EI TECH4YOU Spoke 3 Goal 2 PP1** **- n. 1 scholarship funded by EI TECH4YOU Spoke 3 Goal 4 PP1** **- n. 2 scholarships funded by CN Agritech Spoke 3 WP 3** **- n. 1 scholarship funded by CN Agritech Spoke 9 WP 1**
Degree Qualification requested according to Italian classification	LM-3 Architettura del paesaggio LM-4 Architettura e ingegneria edile-architettura LM-4 c.u. Architettura e ingegneria edile-architettura (quinquennale) LM-6 Biologia LM-7 Biotecnologie agrarie LM-8 Biotecnologie industriali LM-9 Biotecnologie mediche, veterinarie e farmaceutiche LM-13 Farmacia e farmacia industriale LM-17 Fisica LM-18 Informatica LM-22 Ingegneria chimica LM-23 Ingegneria civile LM-24 Ingegneria dei sistemi edilizi LM-25 Ingegneria dell'automazione LM-26 Ingegneria della sicurezza LM-27 Ingegneria delle telecomunicazioni LM-29 Ingegneria elettronica LM-30 Ingegneria energetica e nucleare LM-31 Ingegneria gestionale LM-32 Ingegneria informatica LM-33 Ingegneria meccanica LM-35 Ingegneria per l'ambiente e il territorio LM-40 Matematica LM-41 Medicina e chirurgia LM-42 Medicina veterinaria LM-48 Pianificazione territoriale urbanistica e ambientale LM-49 Progettazione e gestione dei sistemi turistici LM-53 Scienza e ingegneria dei materiali LM-54 Scienze chimiche LM-56 Scienze dell'economia LM-60 Scienze della natura LM-61 Scienze della nutrizione umana

	LM-69 Scienze e tecnologie agrarie LM-70 Scienze e tecnologie alimentari LM-71 Scienze e tecnologie della chimica industriale LM-73 Scienze e tecnologie forestali ed ambientali LM-74 Scienze e tecnologie geologiche LM-75 Scienze e tecnologie per l'ambiente e il territorio LM-76 Scienze economiche per l'ambiente e la cultura LM-82 Scienze statistiche LM-86 Scienze zootecniche e tecnologie animali LM/GASTR Scienze economiche e sociali della gastronomia 3/S (specialistiche in architettura del paesaggio) 4/S (specialistiche in architettura e ingegneria edile) 6/S (specialistiche in biologia) 7/S (specialistiche in biotecnologie agrarie) 8/S (specialistiche in biotecnologie industriali) 9/S (specialistiche in biotecnologie mediche, veterinarie e farmaceutiche) 14/S (specialistiche in farmacia e farmacia industriale) 20/S (specialistiche in fisica) 23/S (specialistiche in informatica) 27/S (specialistiche in ingegneria chimica) 28/S (specialistiche in ingegneria civile) 29/S (specialistiche in ingegneria dell'automazione) 32/S (specialistiche in ingegneria elettronica) 34/S (specialistiche in ingegneria gestionale) 35/S (specialistiche in ingegneria informatica) 36/S (specialistiche in ingegneria meccanica) 38/S (specialistiche in ingegneria per l'ambiente e il territorio) 45/S (specialistiche in matematica) 47/S (specialistiche in medicina veterinaria) 50/S (specialistiche in modellistica matematico-fisica per l'ingegneria) 61/S (specialistiche in scienza e ingegneria dei materiali) 62/S (specialistiche in scienze chimiche) 64/S (specialistiche in scienze dell'economia) 68/S (specialistiche in scienze della natura) 69/S (specialistiche in scienze della nutrizione umana) 74/S (specialistiche in scienze e gestione delle risorse rurali e forestali) 77/S (specialistiche in scienze e tecnologie agrarie) 78/S (specialistiche in scienze e tecnologie agroalimentari) 79/S (specialistiche in scienze e tecnologie agrozootecniche) 81/S (specialistiche in scienze e tecnologie della chimica industriale) 82/S (specialistiche in scienze e tecnologie per l'ambiente e il territorio) 83/S (specialistiche in scienze economiche per l'ambiente e la cultura) 84/S (specialistiche in scienze economico-aziendali) 85/S (specialistiche in scienze geofisiche) 86/S (specialistiche in scienze geologiche) 92/S (specialistiche in statistica per la ricerca sperimentale)
Documents to attach to the application	1. Signed application form for admission to the selection procedure, printed from the online procedure; 2. Research project **(Annex B)**;

	3. Curriculum Vitae in European format; 4. Receipt of the payment of fee of € 65.00 (no refundable); 5. Self-declaration of the degree pursuant to D.P.R. 445 of 28 December 2000; 6. A copy of a valid identification document bearing the signed by the applicant;	
ADMISSION INTERVIEW		
Date and time	**19 gennaio 2023 at 9:30**	
Method	**On-line**	
INVESTIMENT	**EI TECH4YOU** **NATIONAL CENTRE AGRITECH**	**CUP C33C22000290006** **CUP C33C22000260001**
SCHOLARSHIPS	**n. 8 Scholarships positions:** **- n. 3 scholarships funded by EI TECH4YOU Spoke 3 Goal 1 PP1** **- n. scholarships funded by EI TECH4YOU Spoke 3 Goal 2 PP1** **- n. 1 scholarships funded by EI TECH4YOU Spoke 3 Goal 4 PP1** **- n. 2 scholarships funded by CN Agritech Spoke 3 WP 3** **- n. 1 scholarships funded by CN Agritech Spoke 9 WP 1**	
EI TECH4YOU SPOKE 3 GOAL 1 PP1	**TARGETING PRECISION FARMING APPLICATIONS TO AGROECOLOGICAL INTENSIFICATION**	
Title Scholarship n.1	**Implementation of innovative geospatial models and workflows to analyze, characterize, and monitor the vegetative vigor of Mediterranean crop systems**	
Theme to be developed	Developing innovative geospatial models and workflows to analyze, characterize, and monitor Mediterranean crop systems. The monitoring concerns all the phenological cycles of specific crop systems with the aim of optimizing external input applications in the framework of the precision agriculture (PA) paradigm. These developed geospatial models and workflows are based on remotely sensed imagery surveyed by uncrewed aerial vehicles (UAVs) equipped with multispectral (MS) and thermal sensors and on proximal sensing and on-field surveys (chlorophyll content analysis, spectro-radiometer measures, ground truths). The geographic object-based image analysis approaches, coupled with advanced machine and deep learning classifiers, will be implemented and tested to derive appropriate and timely information on the crops' status and obtain the expected results. The results of the research activity will be vegetative vigor and prescription maps of the analyzed crop systems based on specific multitemporal spectral vegetation indices tested and validated on the field. These results contribute to developing a smart agriculture platform for monitoring crops and supporting farmers' decisions based on remotely sensed data, proximal sensing, and on-field surveys implemented using recent Information and Communication Technologies. To this end, the interoperability of the obtained data and results of this research activity represents a crucial topic.	
Period in enterprise	**Mandatory (6 Months)**	
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**	
Title Scholarship n.2	**Microbiome-based solutions to protect crops**	
Theme to be developed	The goal of this PhD project is to develop a metagenomics-based platform to track plant and soil health, enabling farmers to quickly take action against threats to plant health. Results will enhance our understanding of the role of plant pathogens within the plant microbiome and will provide the basis for the development of the	

	bioinformatic platform for microbiome analysis and classification. The PhD student will mainly focus on performing experiments in controlled conditions, precisely testing the influence of several pathogen-host combinations on the plant metagenome and/or metatrascriptome, using a variety of techniques including (but not limited to) amplicon/shotgun metagenomics and/or metatranscriptomics, and a variety of platforms (e.g., Illumina, Oxford Nanopore, PacBio). This massive dataset will be used to (i) ask questions about host-microbiome-pathogen interactions, and (ii) to test a model able to track changes in plant/soil microbiome structure that might influence plant health status. Together, the results will provide an important contribution to the fields of plant-microbiome and plant-pathogen interactions, and they will help the transition towards a more sustainable agriculture by making microbiome-based solution a step closer to reality.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.3	**Smart and sustainable greenhouses**
Theme to be developed	The most important global challenge for the next years will be the production of safe and healthy food due to the world population growth. It is evident that a shift to more sustainable and effective methods of food production is imperative to overcome the challenges associated with the increasing population while maintaining a sustainable food supply. Energy, water, soil and natural resources saving strategies become particularly important on the premise of ensuring effective sustainable crop production. Greenhouse farming can be a solution for these increasing food demands, due to its potential for high productivity with reduced water and agrochemicals use, its production capacity is much higher than open field based agriculture and its high potential for the recycling of water and nutrients. A greenhouse is an energy-intensive sector with substantial greenhouse gas emissions and extensive energy consumption. The research issue is the development of design methods of smart and sustainable greenhouse for future food production. The PhD course will analyse effective energy-saving methods for greenhouse design considering greenhouse structures, growing systems, environmental conditions and lighting systems in respect to the plants need and the better crop production. The research findings energy-saving operation of greenhouses by summarising renewable energy technologies, including photovoltaic modules, heat pumps, wave energy and other energy production systems such as semi transparent photovoltaic generator with mono axial solar tracking integrated with advanced smart control systems. The generated electricity is directly consumed by the greenhouse for crop production while excess amounts are injected into the power grid. These production systems not only will supply great food quantity but will be environmental friendly and will supply energy for other activities.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
EI TECH4YOU SPOKE 3 GOAL 2 PP1	**SMART FORESTRY AND RESILIENCE**

Title Scholarship n.4	**Assesment of effectiveness of naturalistic measures in controlling of hydrological processess in burned forestry**
Theme to be developed	The research activity involves the evaluation of the hydrological response (in terms of runoff and sediment production) of naturalistic interventions (realised exclusively through the use of material available in the forest) and aimed at controlling of erosive phenomena. In particular, in situ use of dead downed logs (properly placed along the level curves and immobilised) will be used to stabilise steep slopes, and the hydrological effects of this conservation measure will be monitored and evaluated within experimental plots equipped with devices for collecting runoff and sediment. Field observation and data will be processed and analysed at different time-scales (single event, annual and pluriannual), also through advanced "expert systems", and hydrological models will be developed and validated.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
EI TECH4YOU SPOKE 3 GOAL 4 PP1	**FOOD PROCESSING**
Title Scholarship n.5	**Shelf life extension of food by using of innovative biodegradable packaging**
Theme to be developed	The theme that will be developed during the PhD will be focused on the identification of interventions aimed at extending the shelf life of some foods with an environmental sustainability approach, based on the choice of innovative biodegradable or edible packaging. In fact, the alternatives compared to the current conditioning solutions will be evaluated, according to different parameters (microbiological, physico-chemical and organoleptic) studied on the case studies, to reach the definition of shelf life times and advantages from the point of view of reducing the impact on the environment. The research studies will possibly involve different biodegradable materials and different formulations of edible coatings which, depending on the food considered, will be applied and evaluated.
Period in enterprise	**Mandatory (6 Months)**
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
CN AGRITECH SPOKE 3 WP 3	**INNOVATIVE STRATEGIES TO PROTECT NATURAL RESOURCES AND REDUCE THE ENVIRONMENTAL IMPACT OF AGRICULTURE**
Title Scholarship n.6	**Solutions for soil quality assessment and protection**
Theme to be developed	Global trends in demand for biomass-based food, feed, energy, and fiber call for a sustainable intensification of agricultural production. From the perspective of sustaining soil functions, this implies the integration of soil productivity with the other soil functions and services, namely carbon sequestration, water purification and retention, and nutrient and matter cycling as well as biodiversity. Soil management is the key to this integration. The research project intend to evaluate the impact of conventionalized" and "agroecological intensified" organic farming systems by using sustainable fertilizers on soil biodiversity and ecosystem functions. Field studies will be carried out using different source of fertilizations and different management techniques to determine at what extent soil biodiversity and soil ecosystem functioning are vulnerable to external input. The aim is to individuate processes that

	indicate when soil is approaching the limits of their natural functioning or productive capacity through the identification of key indicators for soil sustainability assessments, that are most suitable to capture the complexity and multifunctionality of sustainable farming systems and that bestly serve as basis to develop guideline and scientific evidence-based policy making. The methods will be developed by integrating laboratory chemical and biological analysis with sensory used in field to have a clear and prompt indication of early changes in soil that diversely should be identified in a long term. The specific objective is to develop multifactorial soil quality indices able to monitor and evaluate the efficiency and resilience of soil resource in different agricultural soil management systems.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
Title Scholarship n.7	**Testing an automated and optimized aerated lagooning system for agro-industrial wastewater depuration**
Theme to be developed	Despite the pressing issues linked to the management of agro-food wastewater, research has not yet identified the most sustainable system on the environmental and economic points of view. Lagooning seems to be one of the most promising treatment systems, but the majority experiences have not explored in depth its suitability for agro-food wastewater. The objective of this Ph.D. research is the setup of an optimised aerated lagooning pilot plant for depuration of wastewater from the agro-food industries. The system consists of a tank for wastewater storage throughout long periods under intermittent aeration at low flow rate. The plant is supervised by automated sensors that will modulate the air flow rates and the aeration times, based on the temporal variations of the dissolved oxygen concentration of the wastewater. This system is designed to overcome the common drawbacks of agro-industrial wastewater (e.g., olive oil mill and citrus processing wastewater) shown by the activated sludge depuration plants (that are commonly used for other types of wastewater), such as the low efficiency and stability, and high energy costs. The system will be tested on a lab-scale aerated lagoon plant for treating olive oil mill and citrus processing wastewater. We will measure the pH, electrical conductivity, COD, total nitrogen, and polyphenols (for the olive oil mill wastewater) or essential oils (for citrus processing wastewater) as well as the energy consumption in the pilot plant under different operation parameters. The performance of the system will be expressed by the removal rate of the Chemical Oxygen Demand - COD, percent reduction of pH, variation of C/N ratio) as well as by the energy consumption per unit of COD removed. These parameters will allow to estimate the depuration and energy performance of the aerated lagooning plant.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**
CN AGRITECH SPOKE 9 WP 9.5	**INTEGRATION OF NEW DATA AND METADATA ON ORIGIN AND SUSTAINABILITY**
Title Scholarship n.8	**Modelling sustainability and quality of farm processes and food**
Theme to be developed	The PhD course, with a view to the sustainability of agri-food supply chains, aims to develop and validate protocols for evaluating the performance of food processes that take into account the performance of buildings closely related to food quality and safety. Sustainability of agro-food buildings needs a complex iterative process that starts from the design process, goes through the measure of the building performance and of the food production quality and arrives to the global evaluation

	model. The evaluation models currently defined at the international level are developed to determine the level of building sustainability mainly in terms of energy spent and environmental impact generated by the structure itself. But in the agri-food industry, building structures must comply with specific needs and have to take into account the quality of the food products that often must comply with certain production protocols that are indispensable for production and typicality of the product. The main research activity will be to develop and supply, for some typical food productions, performance evaluation models to develop a correct design and achieve the sustainability of the agri-food chain.
Period abroad	**Optional up to a maximum of 6 months to be held by 31.12.2025**