

Training Program 38° Cycle (English)

The PhD in *Cardiovascular Pathophysiology and Therapeutics (CardioPath)* is an International PhD course in cardiovascular physiopathology and related therapies, established in 2015 with to the agreement between 2 Universities and 1 International Research Centre:

- Federico II University of Naples
- University of Bern, Switzerland
- Cardiovascular Research Center Aalst , Belgium

A private nursing home also participated in the project:

- Montevergine Mercogliano Clinic

The PhD in *Cardiopath* has administrative headquarters at the University of Naples Federico II (CF 00876220633) represented by the Rector, Prof. Matteo Lorito; the course coordinator is prof. Raffaele Izzo.

The PhD in “ *Cardiovascular Pathophysiology and Therapeutics* ” aims to provide a systematic understanding and in-depth knowledge of the pathophysiological mechanisms responsible for cardiovascular diseases, and to update PhD students on innovative therapies in the cardiovascular field.

It is a program of excellence in the panorama of Italian Academic Cardiology for the following reasons:

- a) The Academic Council is composed of excellent members with a high reputation both for their scientific competence and for their dedication to teaching and knowledge transfer;
- b) The international platform of the program makes it possible to overcome the limitations in resources and logistics present at the national level;
- c) The vast availability of expertise in the field of scientific research and teaching skills offered by the Research Doctorate Network makes it possible to broaden the spectrum of possible scientific projects that can be implemented.

The areas of interest of the PhD program are:

- a) Heart failure and arrhythmias;
- b) Non-invasive imaging diagnostics of cardio-vascular diseases;
- c) Interventional cardiology;
- d) Arterial hypertension.

Within these areas of interest, PhD students will develop the following skills and competencies:

- a) Familiarize yourself with scientific research tools (from basic to clinical research) in order to enable PhD students to independently investigate the mechanisms and possible therapies of cardiomyopathies;
- b) Be able to conceive, design and carry out a research project;
- c) Develop the necessary skills of synthesis and evaluation of possible complex problems related to research or innovation projects and learn how to solve these problems;
- d) To be able to further expand the available knowledge in order to improve the current diagnostic and therapeutic protocols of cardiomyopathies and propose innovative approaches.
- e) knowing how to work in teams with other researchers.

The training course is based on the following scheme:

- 1) didactic training to provide the cultural foundations necessary for the research activity,
- 2) experimental work in the laboratory or in a clinical setting under the supervision of a Tutor,
- 3) training stay abroad and in Italy.

At the beginning of the course, all PhD students, having assessed their specific inclinations and skills, are entrusted to a Tutor and placed in specific contexts with the aim of acquiring and expanding scientific knowledge through participation in transversal and interdisciplinary activities .

The didactic activities are, in fact, organized according to a training program which promotes the acquisition of multidisciplinary and integrated knowledge through cycles of lectures and seminars held by members of the Academic Board, by Professors holding teaching positions and, in the case of seminars, by eminent Italian and foreign researchers.

The organization of the PhD in “ *Cardiovascular Pathophysiology and Therapeutics* ” will allow individual students to use expertise from leading national and international faculty. Given the importance of the social aspects of cardiovascular diseases, the possibility of training PhDs with integrated knowledge from different sectors of cardiology represents a strong point in the development of future diagnostic and therapeutic tools. Thanks to the marked propensity for internationalization, the professional opportunities offered to PhDs include teaching and research activities in public and private university structures in Italy and abroad, in scientific research and technological development institutes in public and private structures, activities in the field of national health service structures, research and development activities in the pharmaceutical industry, activities in the sector of specialized or popular scientific communication.

Objectives National Recovery and Resilience Plan (PNRR)

One of the main objectives of the PNRR is to address some critical issues that limit the development of our economy and our society and, in particular, the low investment in human capital. With regards to Research Doctorates, the aim is to qualify and innovate doctoral courses, through three strategic objectives: digitalisation, culture of innovation and internationalisation.

The *cardiopath* fits coherently into this context as its main mission is the training of researchers capable of managing research projects in the academic field through the acquisition of numerous skills in the field of biomedical research guaranteed by the synergies between the areas involved in the training course. Numerous features of the *CardioPath* contribute to defining its vision and mission consistent with the objectives of the PNRR. For this reason, in the 38th Cycle, *CardioPath* received additional scholarships financed with funds from the PNRR. The doctoral students holding these specific scholarships will follow specific research projects which must concern topics aimed at bringing about a significant development of knowledge in the areas of interest of the PNRR. Furthermore, the training course must favor the involvement of other research centers and must necessarily include a period of study and research abroad of a minimum of twelve (12) months to a maximum of eighteen (18) months. Finally, the doctoral students holding these additional scholarships will undergo a program of verification and reporting of activities as required by the MUR.

The research doctorate " *International PhD Program in Cardiovascular Pathophysiology and Therapeutics* " (*CardioPath*) is consistent with the goals of the PNRR in that:

- to. it concerns topics with a strong scientific-technological vocation in the field of cardiovascular diseases;
- b. promotes internationality in consideration of the collaboration agreement with 2 European academic institutions: University of Bern, Switzerland ; Cardiovascular Research Center Aalst , Belgium . In addition, a private nursing home is also participating in the project: Clinica Montevergine Mercogliano;
- c. provides for the implementation of the entire doctoral program at the Federico II University, with the exception of periods of study and research abroad;

d. includes periods of study and research abroad from a minimum of twelve (12) months to a maximum of eighteen (18) months;

And. ensures that the PhD student benefits from qualified and specific operational and scientific structures for study and research activities;

f. promotes the exploitation of research results and guarantees the protection of intellectual property.

Doctoral curriculum relating to the PhD course

Some specific minimum requirements have been identified which will be objectively assessed by the Academic Board at the end of the course.

Core Curriculum: Minimum objectives to be achieved in the three-year training period (at least 3 out of 4)

1. Achievement of a linguistic certification of at least B1 level, of knowledge of the English language according to the guidelines established by the *Common European Framework of Reference for Languages* (CEFR) and issued by an accredited body.
2. Stay abroad of at least 6 months at prestigious research institutions for training and research activities in collaborative projects.
3. Co-author of at least 2 scientific articles or alternatively first-name co-author of at least 1 scientific article, published during the three-year training period in scientific journals with strict editorial control that are registered in the two citation databases (Scopus and Web of Science) approved by the MUR for the National Scientific Qualification procedures (ASN).
4. Participation as a speaker (oral communication or invited report) in at least 2 national scientific congresses or alternatively to at least 1 international scientific congress.

Compulsory course for all PhD students

English language course for linguistic improvement and the achievement of English language certifications according to the guidelines established by the CEFR (*Common European Framework of Reference for Languages*)

The English language represents the reference language of scientific knowledge in the biomedical field. For this reason, the CLA (Centro Linguistico di Ateneo) of the Federico II University of Naples organizes English language courses to prepare doctoral students for the achievement of one of the Cambridge ESOL certifications.

The courses are held at the CLA offices (via Mezzocannone 16 or via Partenope 36), which has achieved the certification of excellence being one of the seven Cambridge centers in the southern Mediterranean area. Further information on the activities and organization of the courses is available on the CLA institutional website (www.cla.unina.it).

Participation in PhD courses is free. For access to English courses, doctoral students will have to take a *placement* test and, based on the result of the test, they will then be assigned to a class appropriate to their level of linguistic proficiency (levels B1, B2, C1).

PhD students will have to register to take the *placement* test after the publication on the CLA website (www.cla.unina.it) of the opening of registrations.

The courses will be carried out on the basis of a calendar which will be communicated by the CLA managers after the assignment to the classes. Since participation in the courses is compulsory, it should be noted that at the end of the course it will be necessary to present a certificate of participation in at least one English language specialization course at the CLA during the three-year period. This certificate is preparatory to the achievement of the PhD title.

At the end of the courses there is an exam for the achievement of the Cambridge ESOL linguistic certification, the modalities of which will be communicated directly by the CLA teachers.

Planned/planned teaching activity

The *CardioPath program* aims to provide a systematic understanding and knowledge of the pathophysiological mechanisms underlying heart disease and to expose you to cutting-edge therapies in the cardiovascular field.

The training course lasts 3 years and is achieved with the achievement of 180 ECTS (or CFU): 60 ECTS per year. One credit corresponds to 25 hours of training activity, distributed as follows: 10 hours for webinars or advanced training courses, 15 hours for study or research by the PhD student.

CardioPaTh doctoral program consist of:

- Advanced training courses
- Webinars
- Research-related activities
- Educational and research activities autonomously chosen by the PhD student and approved by the Academic Council

The training activities of the *CardioPaTh program* PhDs focus on 5 main areas of interest:

- a) heart failure;
- b) Arrhythmias ;
- c) Non-invasive diagnostic imaging of heart disease;
- d) Interventional cardiology;
- e) Hypertension.

The training activities are theoretical, methodological and experimental, within Cardiology or across other medical disciplines, aimed at developing the following skills:

- a) Knowing the research tools (from the bench to the patient's bed) that allow to deepen the mechanisms and therapies of cardiomyopathies;
- b) Be able to conceive, design and execute a research project;
- c) Develop the necessary skills of synthesis and evaluation of possible complex problems related to research or innovation projects and how to overcome them;
- d) Be able to further extend the available knowledge in order to improve current diagnostic and therapeutic protocols for cardiomyopathies and propose innovative approaches.

PhD students are required to participate in cultural initiatives, meetings, congresses, workshops at national and international level. PhD students will be encouraged to publish the results of their research activity as abstracts , manuscripts and publications in peer-reviewed journals . PhD students are required to undertake a compulsory training activity of at least 12 months at a non-Italian research or academic institution.

The 3 years of the PhD course

The PhD course is spread over 3 years, as follows:

1. During the first year, the PhD student will choose together with his/her supervisor(s) the main research topic that he/she will develop over the course of the 3 years. The training activities will take place in the form of webinars and advanced training courses specific to the chosen curriculum, as well as with research-related activities.
2. During the second year, the PhD student will consolidate his research activity by carrying out research programs preferably in a foreign location. The latter obligation could also be activated during the first year. The training activities will take place in the form of webinars and specific advanced training courses, as well as with activities related to research.
3. During the third year, the PhD student will be encouraged to finalize his research through the publication of the related results and will devote adequate time to the preparation of the final thesis. The training activities will take place in the form of webinars and specific advanced training courses, as well as with activities related to research.

Il dottorando è tenuto a conseguire 60 CFU annui così ripartiti:

	Corsi di alta formazione (min-max CFU)	Webinar (min-max CFU)	Attività legate alla ricerca (min-max CFU)	Attività indipendenti di formazione e ricerca (min-max CFU)	CFU (o CFU)
1° Anno	4-8	16-20	20-28	8-16	60
2° Anno	4-8	16-20	20-28	8-16	60
3° Anno	0	8-16	10-18	34-42	60

Advanced training courses:

- Basic and advanced statistical evaluation of research results;
- English;
- Design and management of clinical or translational studies;
- Courses already activated at the Academic Institutions of the CardioPaTh network .

Webinars :

- Given the international nature of CardioPaTh , national and international lecturers will hold webinars (e.g. webinars) on topics of interest to cardiovascular research.
- PhD students are required to devote adequate time to the preparation of each webinar by critically evaluating the available literature on the subject.
- Webinars are facilitated to encourage the PhD candidate to develop critical thinking and stimulate discussion and interaction with faculty .
- The list of webinars is at cardiopath.eu/seminars

Research-related activities:

- These are activities related to research topics of interest in the form of participation as a participant in workshops, conferences and congresses.

- Involvement in collaborative research projects aimed at the scientific growth of the PhD student with research groups and laboratories outside the CardioPaTh network .
- PhD students may also be involved in limited integrated teaching activities during master's degrees.
- Research activities carried out on the foreign campus

Independent training and research activities:

- They include all the research activities approved by the Academic Council carried out autonomously by PhD students in relation to the preparation of the final thesis.
- PhD students will be encouraged to present the results of their research at meetings in the form of abstracts , oral presentations.
- Publications will be considered based on their position in the authorship: greater value will be given to the first and last authorship, or to the mailing address. Co-authorship will also be considered.

The lessons will be held in the months of March and October 2023 with one of the following modalities based on the progress of the Covid-19 health emergency: a) AT A DISTANCE on the Microsoft Teams digital platform of the University, b) IN THE PRESENCE in the classroom " Condarelli " (Building 2, Ground Floor). The definitive modalities together with the calendar with dates and times will be communicated via email to all PhD students.

Course title	ECTS	Hours	Professor	Year
-Preclinical models of cardiovascular disease -Alteration of endothelial function in cardiovascular diseases. -Molecular mechanisms of heart failure	1	25	Prof. Michele Ciccarelli	1
-Acute aortic syndrome -Post implantation syndrome-Pulmonary pressure response exercise- Insights from the International Ref gistry Acute Aortic Dissection (IRAD)	1	25	Prof. E. Bossone	1
-Hypertensive Urgencies and Emergencies -Benefit of Physical activity and cardiorehabilitation -Echo and fluid balance in ICU- CardioVascular Emergency Organization	1	25	Prof. N. De Luca	1
-Role of sex and gender in preclinical models of cardiovascular disease -Role of gut microbiota in cardiovascular health and disease -Induced pluripotent stem cells in cardiovascular disease	1	25	Prof. C. Perrino	1

- Unexplained left ventricular hypertrophy: genetic and clinical aspects -New medical treatments in hypertrophic cardiomyopathy Amyloidosis aTRR : wt and genetic disease -Fabry-Anderson disease-The restrictive cardiac pathophysiology: implication for the correct medical treatment	1	25	Prof. M. Losi	1
-Impact of physical activity and exercise on the physiology of the Musculoskeletal system -Assessment of physical needs-The prescription of adapted physical activity-The impact of prescription in the main chronic pathologies	1	25	Prof. G. Iaccarino	2
- Obesity and heart failure - Insulin resistance and hypertension - Vitamin d and insulin resistance	1	25	Prof. C. Morisco	2
-COVID-19 and endothelial function: from the lab to clinical trials -Ketone bodies in heart failure-Calcium: from arrhythmias to diabetes- SGLT2 inhibitors and cardiovascular health	1	25	Prof. G. Santulli	2
-New atrial fibrillation ablation techniques -Percutaneous closure of the auricula in the prevention of cardioembolic risk-Treatment of cardiac disorders in patients with heart failure-Modulation of cardiac contractility in the treatment of heart failure	1	25	Prof. A. Rapacciuolo	2