



Challenges and innovative approaches in cardio-metabolic disease

Learn about novel pathophysiological mechanisms and therapeutic approaches related to cardiac dysfunction, heart failure and metabolic disease expanding from basic research to clinical practice and using innovative ways of teaching and learning

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CIVIS FOCUS AREA

Health

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**MA
Phd**

FIELD OF STUDIES

Medicine and Health

COURSE DATES

12 February 2024 - 7 June 2024

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7 noviembre 2023

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PRACTICAL DETAILS

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Dates: 12 February 2024 - 7 June 2024

Total workload: 175 hours

Format: Blended

ECTS: 6*

Location: Athens, Greece

Language: English (B2-C1)

* Recognition of ECTS depends on your home university.

The contact point for this course is imour@med.uoa.gr.

Physical mobility

Physical Meeting Programme

1. Cardiovascular diseases related to inflammation and fibrosis (3 June 2024)

Lecture Theater sessions

- 9.00-10.00 CET Esteban Gurzov (ULB), Title: ***Dysfunctional signal transduction in inflammation and fibrosis***
- 10.00-11.00 CET Dennis Cokkinos (BRFAA) Title ***Degenerative aortic stenosis. Is it preventable or reversible? A translational approach***

Coffee Break

- 11.30-12.15 CET Students Presentation
- 12.15-13.15 CET Simulation Session 1 (UAM): ***Cell Energetics and Metabolic Flux Analyzer*** Moderator: Oscar Lorenzo González

Hands/on sessions 14.30-17.30 CET

- Students' Group A **Module 1** (Moderator Concha Peiró)
- Students' Group B **Module 2** (Moderator Esteban Gurzov)
- Students' Group C **Module 3** (Moderator Oscar Lorenzo González)
- Students' Group D **Module 4** (Moderator George Loudos, Maritina Rouchota)
- Students' Group E **Module 5** (Moderator Nicolas Baeyens)

2. Diabetes related cardiovascular disease (4 June 2024)

Lecture Theater sessions

- 9.00-10.00 CET Ernesto Maddaloni (SUR) Title: ***Vascular damage in adult-onset autoimmune diabetes***
- 10.00-11.00 CET Gratiela Gradisteanu (UB) Title: ***Current trends in bioengineering for diabetes***

Coffee Break

- 11.30-12.15 CET Students Presentation
- 12.15-13.15 CET Simulation Session 2 (SUR): ***Clinical evaluation of endothelial dysfunction and damage*** Moderator: Ernesto Maddaloni

Hands/on sessions 14.30-17.30 CET

- Students' Group A **Module 2** (Moderator Esteban Gurzov)
- Students' Group B **Module 3** (Moderator Oscar Lorenzo González)
- Students' Group C **Module 4** (Moderator George Loudos, Maritina Rouchota)
- Students' Group D **Module 5** (Moderator Nicolas Baeyens)
- Students' Group E **Module 1** (Moderator Concha Peiró)

3. Vascular aging and microvascular dysfunction in cardiovascular disease (5 June 2024)

Lecture Theater sessions

- 9.00-10.00 CET Concha Peiró (UAM), Title: **Angiotensin-(1-7): the protective branch of the renin-angiotensin as a vascular anti-ageing target**
- 10.00-11.00 CET Nicolas Baeyens (ULB), Title: Tissue **Transparization and volumetric imaging: new technical approaches to investigate cardiovascular disorders**

Coffee Break

- 11.30-12.15 CET Students Presentation
- 12.15-13.15 CET Simulation Session 3 (ULB) **Volumetric Microscopic Imaging**, Moderator: Nicolas Baeyens

Hands/on sessions 14.30-17.30 CET

- Students' Group A **Module 3** (Moderator Gratiela Gradisteanu, Ernesto Maddaloni)
- Students' Group B **Module 4** (Moderator George Loudos, Maritina Rouchota)
- Students' Group C **Module 5** (Moderator Athanasios Lourbopoulos)
- Students' Group D **Module 1** (Moderator Concha Peiró)
- Students' Group E **Module 2** (Moderator Esteban Gurzov)

4. Novel approaches for diagnosis and therapy for heart failure (6 June 2024)

Lecture Theater sessions

- 9.00-10.00 CET : Oscar Lorenzo González (UAM), Title: **Plasma biomarkers for diagnosis and prognosis of cardiac failure**
- 10.00-11.00 CET Iordanis Mourouzis (NKUA), Title: **Triiodothyronine as a novel therapeutic approach for repair/regeneration after myocardial infarction**

Coffee Break

- 11.30-12.15 CET Christodoulos Xinaris (Mario Negri, Italy), Title: Modulating Thyroid Hormone Signaling to regenerate Diabetic organs
- 12.15-13.00 CET Students Presentation

Hands/on sessions 14.30-17.30 CET

- Students' Group A **Module 4** (Moderator George Loudos, Maritina Rouchota)
- Students' Group B **Module 5** (Moderator Athanasios Lourbopoulos)
- Students' Group C **Module 1** (Moderator Gratiela Gradisteanu, Ernesto Maddaloni)
- Students' Group D **Module 2** (Moderator Iordanis Mourouzis)
- Students' Group E **Module 3** (Moderator Polyxeni Mantzouratou)

5. Novel approaches for end/stage heart failure- Preservation and repair of the donor heart (7 June 2024)

Lecture Theater sessions

- 9.00-10.00 CET Themistoklis Thamogeorgakis (Onassis Cardiac Surgery Center), Title: **Current technique of cardiac allograft procurement**
- 10.00-11.00 CET Dr. med. Sebastian Rojas Hernandez (Universitätsklinik der Ruhr-Universität Bochum), Title: **Machine perfusion as a novel approach for donor heart preservation**

Coffee Break

- 11.30-12.15 CET Constantinos Pantos (NKUA), Title: **Role of Thyroid hormone in Donor Heart Preservation and Repair under Machine Normothermic Perfusion**
- 12.15-13.00 CET Evaluation

Hands/on sessions 14.30-17.30 CET

- Students' Group A **Module 5** (Moderator Athanasios Lourbopoulos)
- Students' Group B **Module 1** (Moderator Gratiela Gradisteanu)
- Students' Group C **Module 2** (Moderator Iordanis Mourouzis)
- Students' Group D **Module 3** (Moderator Polyxeni Mantzouratou)
- Students' Group E **Module 4** (Moderator George Loudos, Maritina Rouchota)

Hands/on sessions Practice (5 modules)

Each module will be repeated each day with a different group of students. All students will practice all modules.

- **Module 1.** In vivo model of myocardial infarction in rodents
- **Module 2.** Ex vivo models of isolated heart perfusion in rodents
- **Module 3.** Echocardiography in rodents
- **Module 4.** high resolution micro-SPECT & CT imaging, *in vivo* optical imaging system for fluorescence and bioluminescence in rodents
- **Module 5.** Advanced microscopy, ultimate 3D imaging of solvent-cleared organs (uDISCO) with light sheet microscopy

Simulation Sessions

A selected group of students with access to the relevant equipment will practice the model or technique under expert supervision and will prepare a demonstration/video and present the technique to the other students during the physical meeting.

- Clinical evaluation of endothelial dysfunction (flow mediated-dilation) and damage (IMT measurement, atherosclerotic plaque evaluation)
- Advanced molecular and microscopy techniques that will include measurement of bioenergetic states of different cells (cardiomyocytes, endothelial cells and monocytes/macrophages) by quantifying their metabolic respiration with the technology of a metabolic flux analyzer
- Volumetric Microscopic Imaging

Virtual part

February 12, **Introductory Lecture: Epidemiology and Challenges in CardioMetabolic Disease** (Presenter: Fernando Rodriguez Artalejo, Jose Luis Lopez Sendon, 45min)

- Basic epidemiology of CardioMetabolic Disease
- Current therapies
- Future challenges and Unmet needs

Virtual Unit 1

February 13 (14.00-15.00 CET) **A. Risk of complications in diabetes: heterogeneity among diabetes types.** (Presenter: E. Maddaloni, SUR, 20min). **B. Journal club** (Coordinators: Group A of students). Discussion.

- Phenotypes and endotypes of adult-onset diabetes
- Risk stratification of vascular diabetic complications in different diabetes types
- Implications for therapies

February 15 (14.00-15.00 CET) **A. Insights into the mechanisms of diabetic complications** (Presenter: Anca Hermenean, UB, 20min). **B. Journal club** (Coordinators: Group B of students). Discussion.

- Animal models to study diabetes complications
- Modulation of signal transduction pathways
- Molecular regulation of anti-fibrotic responses in diabetes

February 19 (14.00-15.00 CET) **A. The role of Peripheral Blood Mononuclear Cells in cardiometabolic disorders** (Presenter: R. Risi, SUR). **B. Journal club** (Coordinators: Group C of students). Discussion.

- PBMCs: heterogeneity of the population and isolation methods
- PBMCs as marker of metabolic disease
- Immunometabolic activation of PBMCs: a possible pathogenetic moment in metabolic disease?

February 22 (14.00-15.00 CET) **A. Type 2 Diabetes: From Pathophysiology to Cyber Systems** (Presenter: Anca Pantea Stoian, UB, 20min). **B. Journal club** (Coordinators: Group D of students). Discussion.

- Lifestyle and nutritional interventions in diabetes
- Systems to support early diagnosis and prevention of prediabetes

Virtual Unit 2

February 26 (13.30-14.30 CET) **A. Cell senescence, inflammaging and vascular disease.** (Presenter: C. Peiró, 20min). **B. Journal club** (Coordinators: Group E of students). Discussion.

- Vascular ageing: why does it matter?
- The hallmarks of vascular ageing
- Vascular cell senescence, the SASP and inflammaging

February 29 (13.30-14.30 CET) A. **Development of fibrosis in the cardiovascular system** (Presenter: O.Lorenzo, 20min). B. **Journal club** (Coordinators: Group A of students). Discussion.

- Sobreexpresion of extracellular matrix (ECM) components
- Deregulation of ECM degradation
- Accumulation of ECM and cardiac remodelling

March 4 (14.00-16.00 CET) A. Presenter E. Gurzov: **Systems biology of fibrosis** (30min). Discussion.

- Brief introduction to novel techniques for the study of metabolic diseases (single cell RNA-Seq, spatial transcriptomics, spatial lipidomics, etc).
- Use of stem cells for gene editing, differentiation in metabolic cells and pathology modelling.
- Therapeutic possibilities and future perspectives.

B. Presenter N. Baeyens: **cardiovascular biomechanics (inflammation, fibrosis and remodeling)**. (30min) Discussion. C. Presenter A. Bondue: **Clinical genetics of cardiovascular disorders** (30min) Discussion.

March 7 (14.00-15.00 CET) A. **Journal club** 1 (Coordinators: Group B of students). Coordinators N. Baeyens, E. Gurzov, A. Bondue B. **Journal club** 2 (Coordinators: Group D of students). Discussion.

- The basic elements of a correct participant information sheet and informed consent document.
- Making an application for ethical review and regulatory approval.
- The ethical and regulatory review process.

Virtual Unit 3

March 11 (13.30-14.30 CET) A. **Health policies in diabetes and cardiovascular health and clinical trials** (Presenter: Oana Geambasu, 20min). B. Design and present the summary of a clinical trial for diabetes/cardiovascular disease interventions (Coordinators: Group A of students). Discussion.

- Strategy, public policy, and governmental programs
- Research, innovation, and technology strategies based on the most recent global trends and examples of good practice.

March 14 (13.30-14.30 CET) A. *From treat to target to treat to benefit in diabetes: the changing landscape of cardiovascular outcome trials in diabetes* (Presenter: E. Maddaloni, 20 min). B. Critical analysis of different cardiovascular outcome trials in diabetes, focusing on the impact of different study design and different enrolled populations on the clinical implications (Coordinators: Group B of students) Discussion.

- Glycemic control and CVD in diabetes: does it matter?
- Cardiovascular outcome trials (CVOT) in type 2 diabetes
- Impact of CVOT on clinical practice guidelines

March 18 (13.30-14.30 CET) **How to apply for the ethical approval of a clinical trial** (Presenter: A. Borobia, 50 min). Discussion

- Regulation of clinical trials in Europe: the basics.

- Participants rights in clinical trials
- Ethical evaluation of clinical trials: the protection of participants.

March 21 (13.30-14.30 CET) **Design and draft an ethical committee approval and an informed consent** (Coordinators: Group C of students). A. Borobia, A. Carcas.

- The basic elements of a correct participant information sheet and informed consent document.
- Making an application for ethical review and regulatory approval.
- The ethical and regulatory review process.

Virtual Unit 4

April 8 (13.30-14.30 CET) A. **Introduction to therapeutic approaches for cardiac regeneration to combat heart failure.** (Presenter: I. Mourouzis, 20min). B. **Journal club** (Coordinators: Group C of students). Discussion.

- Examples of cardiac regeneration in nature
- Different ways to regenerate the heart – target cells
- Current research and efforts: where we stand

April 11 (13.30-14.30 CET) A. **Introduction to cardiac organ donor preservation methods: the unmet need of heart transplantation.** (Presenter: C. Pantos, 20min). B. **Journal club** (Coordinators: Group E of students). Discussion.

- Heart transplantation as a very effective and unique therapy for end-stage heart failure
- Cardioplegia as the gold standard for cardiac donor preservation: strengths and limitations
- Novel methods for cardiac donor preservation to expand the donor pool

April 15 (13.30-15.00 CET) A. **How to design a phase II Clinical Trial with novel drugs in cardiovascular disease** (Presenter: I. Mourouzis, 30min). B. Design and present the summary of a clinical trial for a new regenerative therapy for the heart including the main components such as inclusion/exclusion criteria, sample size, end-points, follow-up (Coordinators: Group D of students).

- The appropriate design in a new phase II trial with a novel drug in patients with myocardial infarction
- How to select inclusion/exclusion criteria in a new phase II trial with a novel drug in patients with myocardial infarction
- How to select the Primary and secondary outcomes
- Calculate the number of patients to be included

Virtual Unit 5

April 22 (13.30-14.30 CET) **Write and present a 2-page letter of intent for a grant proposal on “Cardiovascular disease in diabetes” guided by tutors** (Presenter: Group E of students). Coordinators: E. Maddaloni, Giulia D’Amati, R.Risi Students would have to come up with a new hypothesis, a methodological plan to test it within a two years frame period and prepare a project proposal

- How to formulate a scientifically-sound hypothesis and appropriate objectives

- Choose the correct study design to pursue the specified objectives
- Time-line and GANTT chart

April 25 (13.30-14.30 CET) *Write and present a 2-page letter of intent for a grant proposal on “Novel therapeutic approaches in type 2 diabetes” guided by tutors* (Presenter: Group A of students). Coordinators Gratiela Gradisteanu, Sorina Dinescu.

- How to formulate a scientific research idea
- Tips and tricks on milestones, deliverables and key project indicators
- How to formulate working packages and tasks

May 13 (14.00-16.00 CET) **Grant writing** (Presenter: Group B of students). Coordinators N. Baeyens, E. Gurzov, A. Bondue

- Students would have to come up with a new hypothesis,
- a methodological plan to test it within a two years frame period and
- prepare a project proposal

May 16 (13.30-14.30 CET) *Write and present a 2-page letter of intent for a grant proposal on “novel therapeutic approaches for cardiac regeneration” guided by tutors* (Presenter: Group C of students). I. Mourouzis, C. Xinaris, A. Loubopoulos

- Students would have to come up with a new hypothesis,
- a methodological plan to test it within a two years frame period and
- prepare a project proposal

Journal Clubs

Publications will be given to all students before the beginning of the program (January 2024). In order to prepare the journal clubs (which will take place after the frontal lesson of the tutors). All students will have to work on the assigned publications focusing on the following issues:

- Describe the hypothesis of this paper. How the authors reached this hypothesis? Is the hypothesis sound?
- Describe the design of the study. Is the design adequate to address the hypothesis?
- Describe the methodological tools that the authors used to address the hypothesis.
- Describe the results and conclusions. Do results fully support the conclusions?
- How this work advances knowledge in the field. Define the strengths and weaknesses.

The Coordinating Group of students will work with the academic staff to be able to define the correct answers to these questions. Then, the Coordinating Group of students will guide the discussion with the other students within the activity.

Requirements

- English level B2-C1
- Computer literacy

This course is open to Masters' in Health Sciences (Medicine, Biology, Pharmaceuticals etc) and PhD students at [CIVIS member universities](#) studying subjects linked to cardiovascular and metabolic disease.

In addition, applicants should demonstrate a sufficient level of English language to communicate (oral and written) with their peers, speakers, professors, researchers and administrators (B2-C1).

NB: Visiting Students - Erasmus Funding Eligibility

To be eligible for your selected CIVIS programme, you must be a fully enrolled student at your CIVIS home university at the time you will be undertaking the programme. [Click here to learn more about the eligibility criteria.](#)

Students from CIVIS' strategic partner universities in Africa cannot apply for participation in this course.

Application process

Send your application by [filling in the online application form](#) by 7 November 2023 with the following documents:

- Motivation letter
- CV
- Level of English (CEFR)

Evaluation Criteria of students' applications will be based on:

- Relevance of the MsC or PhD program to the course
- CV showing scientific contribution to the field of cardiovascular and metabolic disease
- Motivation letter

Assessment

Evaluation will be performed using 3 criteria:

- A multiple choice questions test (50%),
- Performance during classes and presentations (40%)
- Assistance (10%).

During each virtual unit, students will be evaluated with a maximum of 8 points for performance during classes and presentations and 2 points for assistance. Thus, each student can reach a maximum of 10 points for each unit and a total of 50 points for all 5 units. Furthermore, a multiple choice questions (MCQ) test will be performed at the end of the program. Each participating University will prepare 5 MCQs corresponding to the classes performed for a total of 25 MCQs. Each correct answer will count for 2 points for a total of 50 points. Thus, the maximum evaluation for the virtual component of a student can reach 100 points.

Blended Intensive Programme

This CIVIS course is a Blended Intensive Programme (BIP): a new format of Erasmus+ mobility which combines online teaching with a short trip to another campus to learn alongside students and professors across Europe.

[Click here to learn more about CIVIS BIPs.](#)

GDPR Consent

The CIVIS alliance and its member universities will treat the information you provide with respect. Please refer to our [privacy policy](#) for more information on our privacy practices. By applying to this course you agree that we may process your information in accordance with these terms.

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