



UNIVERSITÀ
DI PAVIA

Ph.D. Program in Electronics, Computer Science and Electrical Engineering

Flash PhD Course: Co-Creation for Research & Innovation in Power Systems & Power Electronics

Proff. Marina Perdigão e Adelino Pereira

OBJECTIVES: The course intends to encourage interdisciplinary collaboration and co-creation, to help PhD students refine their research ideas with fresh perspectives, to apply key innovation concepts (AI, disruptive innovation, impact) to their work and to develop a broader vision of how research can lead to impact beyond academia. The course will also include specialized lessons on power electronics applications and power systems, so that all the students can fruitfully attend lessons on advanced topics.

PROGRAM

1st Session (28th of May, afternoon): Visiting Institution - Research Insights, Professors' Research Interests & Projects

Introduction: Presenting IPC-ISEC (Polytechnic Institute of Coimbra, Coimbra Institute of Engineering)

1. Marina Mendes S. D. Perdigão – Research in resonant converter design and applications

*Resonant converter basics, Resonant converters for LED Lighting solutions based on Variable Inductor control, Brief explanation on Variable Inductor Operating Principle and applications.
Resonant converter for inductive power charging (IPT) for Electric mobility, Dynamic vs Static IPT and impact on compensation networks.
Projects and opportunities for brief research internships: inWheel IPT systems, Shore power solutions based on modular approaches.*

2. Adelino Pereira – Power Systems Reliability and Planning

*Distribution System Reliability Assessment;
Generation expansion planning in competitive electricity markets - using system dynamics, genetic algorithms and Monte Carlo simulation.*

Q&A and Discussion

2nd Session (29th of May, morning): Co-Creation (BYOD¹)

In this session the co-creation process aims to jointly develop and define research questions that meet collective interests taking into account several dimensions: (1) Collaborative action among researchers (PhD students); (2) Process of co-learning towards innovation; (3) Contextual knowledge production; (4) Generating meaning; and, (5) Open, trustful and inclusive dialogue. For this several sessions are planned:

1: PhD Pitch & Team Formation (45 min)

- a. **5-min introduction** by visiting professors on the purpose of the session.
- b. **Student Pitches (30 min):**
Each student presents a **3-minute pitch** about their PhD topic.
Professors provide quick feedback.
- c. **Team Formation (10 min):**
Students are grouped into **multidisciplinary teams** (2-3 people).
Teams will **not** include people working in similar topics or in each other topics.

2: Co-design - applying alternative concepts to different research focus (90 min, in rotating groups)

Each group rotates through three 30-min concept discussions where they must apply the concept to another student's PhD topic (not their own).

- a. **Artificial Intelligence (AI) & Tech Impact**
How could AI enhance or disrupt the research topic?
Could AI be used to accelerate results, automate processes, or create new insights?
- b. **From Research to Innovation**
Identify a potential real-world application.
What would be the first step in moving from research to innovation?
Discuss funding and collaboration opportunities.
- c. **Innovation & Disruption**
Is the research idea **incremental, innovative, or disruptive**?
Identify potential barriers to adoption and ways to overcome them.

3: Results & Assessment (45 min)

- a. **Team Reflection (20 min)**
Teams summarize key takeaways in a mood board (focus on what they learned from applying concepts to colleagues' work).
- b. **Team Presentation (15 min)**
Each group presents their key takeaways in a **5-min pitch**.
- c. **Visiting professors and PhD students give feedback (10 min)**

4: Impact and Innovation Potential (30 min)

*Each group through a **concept discussion** tries to answer the following questions related to Long-term impact:*

¹ Bring Your Own Device (laptop, PC, tablet, ...)

- How significant are the potential transformative positive effects that the envisioned research would have to our economy, environment and society?
- How does the research contribute to EU's Green Deal, carbon neutrality, energy security?
- To what extent does the envisioned research have potential for generating disruptive innovations in the future and for creating new markets?

ATTENDANCE: The course will take place in person in Magenta Room, D-floor

LECTURES: 8h; **CREDITS:** 2,6 CFU (including 1 CFU for the presentation)

DATES: May 28th (2:00-6:00pm), 29th (9:00am-1:00pm) 2025

Organizer

Prof.ssa Norma Anglani

Ph.D. Coordinator

Prof.ssa Ilaria Cristiani

Seminar in English

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Prof. Marina M. S. Perdigão received the M.Sc. and Ph.D. degrees in electrical engineering from the University of Coimbra. Since 2012 Marina Perdigão has been with the IPC-ISEC as Adjunct Prof., as well as permanent staff member at IT. Her teaching activities have focused on the areas of power electronics mainly. She teaches on a yearly basis at University of Oviedo *Ind.Electronics RES* as part of the Int. Master Energy Conversion and Power Systems. At IPC-ISEC, she was the department IR Coord. (14-18). She is the Erasmus Mundus Joint Master Degree in Sust.Transp./EPS local coordinator, which receives full financial support from the European ECE Agency, since its first edition in 2012. She has supervised several degree projects and master's dissertation at ISEC-IPC and at FCTUC, as co-supervisor, especially in the areas of PE, consistently in the area of magnetic devices and their applications, topologies and resonant converters (with demonstrators). After her PhD she continued her interest in modelling and FEA of complex magnetic components and applications. She is currently co-supervising 2 PhD thesis: in dynamic IPT for EVs (FCTUC), where resonant circuits and the magnetic induction system are key; in design of planar magnetics applied to LLC LED CCT tuning driver (UFSM, Brazil). Within her group she is actively supporting 2 other Ph.D. Her collaboration with Int. R&D teams, at UniOvi, UFSM, USherbrooke has allowed joint publications involving engagement of young researchers in training. Under these collaborations she has hosted internships for European PhD mention. In the past 5 years she co-authored at least 10 journal papers in highly referenced journals and more than 10 conf. papers. Since 2021 she acted as independent evaluator/expert at CINEA, for HORIZON projects, EIC proposals and CET partnership at EU level. She has been a PI or Co-Pi in nationally funded projects. She has an h-index 19.



Prof. Adelino Pereira received the M.Sc. and Ph.D. degrees in Electrical Engineering from the Faculty of Engineering of the University of Porto, Portugal. He is Professor at the Electrical Engineering Department of the Polytechnic Institute of Coimbra (IPC/ISEC), Portugal. His research interests include: Power Systems Analysis and Simulation; Power System Reliability; Power Generation Expansion Planning; Distributed Generation; Renewable Energy; Electricity Markets. He is a researcher at INESC Coimbra and at the Research Group on Sustainability, Cities and Urban Intelligence (SUScita), Coimbra

