EPE'25 – Call for Tutorials

Streamlining Power Electronics Innovation: Rapid Prototyping for R&D, Education, and Industry

Name(s) and Affiliation(s) of the Lecturer(s): PRELIMINARY – to be completed

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Tutorial Objectives:
This tutorial will provide participants with an in-depth understanding of rapid prototyping in power electronics. It will emphasize how using standardized power hardware and advanced coding workflows—such as Imperix's graphical programming platform—can streamline R&D processes and educational activities. Key objectives include:
1. Differentiating rapid prototyping from simulation-based methodologies.
2. Highlighting practical case studies from industry and academia.
3. Demonstrating the scalability of these approaches towards microgrid and product development.

Target Audience:
This tutorial is designed for:
- Academic researchers and educators in power electronics and energy systems.

- Industrial engineers involved in system design, validation, or commissioning.
- R&D professionals seeking to enhance prototyping and product development efficiency.

Topical Outline:

Introduction (20 minutes, imperix):
- Overview of rapid prototyping: Principles and role in power electronics.
- Power prototyping and control prototyping basic principles
- Comparison with simulation-based techniques (e.g., C-HIL, P-HIL).

Theme 1: Accelerating R&D through Rapid Prototyping (40 minutes, imperix):
- Benefits and challenges of adopting rapid prototyping in power electronics.
- Workflow demonstration using Imperix's graphical programming tools.
- Examples of real-world applications

Theme 2: Insights from Academia (30-40 minutes, University of Padova):
- Educational value of rapid prototyping in power electronics courses.
- Integrating prototyping platforms into labs and projects.

Theme 3: Industrial Applications (30-40 minutes, Mersen France):
- Industrial lecturer: Benefits of rapid prototyping in power stack commissioning.
- Practical examples highlighting reduced time-to-market and improved system validation.

Theme 4: Rapid prototyping beyond converter R&D (30 minutes, imperix):
- Extending methodologies to microgrid systems and distributed power conversion.
- Bridging R&D and product development
- Future trends in prototyping and validation

Conclusions (20 minutes):
- Key takeaways and open Q&A session.

Provisional Schedule of the Tutorial:

14:00 - 14:20: Introduction
14:20 - 15:00: Theme 1
15:00 - 15:30: Theme 2
15:30 - 15:45: Coffee break
15:45 - 16:25: Theme 3
16:25 - 16:55: Theme 4
16:55 - 17:15: Conclusions

About the Lecturers:

IRATI IBANEZ-HIDALGO received the B.Sc. and M.Sc. degrees in industrial engineering, and the Ph.D. degree in robotics and automatic control system from the University of the Basque Country (UPV/EHU), Bilbao, Spain, in 2018, 2020, and 2024 respectively.
Since 2024, she is a Research Development Engineer with imperix Ltd, Sion, Switzerland. Her research interests include active power filters, modulation and control of power converters, multilevel converters and low-frequency modulation techniques.

Tommaso CALDOGNETTO (Senior Member, IEEE) received the M.S. (Hons.) degree in electronic engineering and the Ph.D. degree in information engineering from the University of Padova, Padova, Italy, in 2012 and 2016, respectively.,He is currently an Assistant Professor with the Department of Management and Engineering, University of Padova, Vicenza, Italy. His research interests include the control of grid-tied converters, microgrid architectures, converters for dc nanogrids, and real-time simulation for power electronics applications.,Dr. Caldognetto has been an Associate Editor for the IEEE Open Journal of Power Electronics, since 2019.

Tommaso CALDOGNETTO (Senior Member, IEEE) received the M.S. (Hons.) degree in electronic engineering and the Ph.D. degree in information engineering from the University of Padova, Padova, Italy, in 2012 and 2016, respectively.,He is currently an Assistant Professor with the Department of Management and Engineering, University of Padova, Vicenza, Italy. His research interests include the control of grid-tied converters, microgrid architectures, converters for dc nanogrids, and real-time simulation for power electronics applications.,Dr. Caldognetto has been an Associate Editor for the IEEE Open Journal of Power Electronics, since 2019.

[to be updated.] Dominique Tournier (M'04) received the Ph.D. degree from the Institut National des Sciences Appliquées (INSA), Lyon, France, in 2003.,From 2003 to 2005, he was with the Centro Nacional de Microelectronica, Barcelona, Spain, involving in SiC power diodes and MOSFET development. From 2005 to 2015, he was an Associate Professor at the Ampère Laboratory, INSA. He was a Supervisor of four Ph.D. theses. Since 2016, he has been a CTO with Caly Technologies, Lyon. His recent works deal with SiC-based devices design (current limiting, devices, and diodes) as well as power electronics applications for WBG devices and protection devices. He has authored or co-authored over 120 research papers

in journal and conferences, mostly on SiC devices and applications. He holds nine patents, mostly focused on protection devices and systems. His current research interests include the SiC device design and fabrication for high-power electronics applications and functions integration for high-temperature electronics.