



**Politecnico
di Torino**

Dipartimento Energia
"G.Ferraris"



Electro-mobility – Insights on battery principles and modelling techniques

Javier Marco Gimeno
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Universitat Politècnica de València***

Seminar
26, 27, 28 November 2025
1, 2 December 2025

Abstract

The short course provides a comprehensive introduction to the fundamentals of electro-mobility and lithium-ion battery technologies. Structured into four modules, the program combines theoretical lectures, practical examples, and hands-on sessions to equip PhD students with essential knowledge of electrochemistry and battery modeling approaches used in both academia and industry. Participants will explore fundamental electrochemical concepts, learn the main modeling methodologies (ECM, DFN, SPM) using PyBaMM, and study key safety aspects of lithium-ion batteries at both cell and module levels. Topics include the characterization and modeling of thermal runaway phenomena, simulation-based analysis, and cooling strategies for battery modules. By the end of the course, students will have gained a solid understanding of the electrochemical and thermal behavior of batteries and their relevance to modern electro-mobility systems.

Javier Marco Gimeno

He is a Postdoctoral Researcher at the Clean Mobility and Thermofluids Institute (CMT) of the Universitat Politècnica de València, specializing in computational modelling of electrochemical behavior and thermal runaway in lithium-ion batteries. He holds a PhD (Cum Laude) in Propulsive Systems for Transport, an MSc in Thermal Power from Cranfield University and a Master in Propulsive Systems for Sustainable Mobility from UPV. His research focuses on high-fidelity simulation and experimental validation of battery safety, degradation and thermal runaway propagation phenomena, while also leveraging prior experience in combustion engine aftertreatment and CFD studies of post-treatment injection systems and spray breakup dynamics. He has published extensively in leading journals and completed a research stay at Argonne National Laboratory.



Seminar Program

The series of seminars to be proposed would be divided into 4 main topics which will cover theory lessons, realistic examples and hands-on sessions so that the PhD students end up with basic notions of electro-chemistry concepts and the modelling approaches used in academia and industry.

Module 1: Introduction to electro-mobility and electro-chemistry

- Overview of the technologies associated to electro-mobility, with focus on energy storage through Lithium-Ion cells.
- Basic concepts on batteries
- Introduction to electro-chemistry. Basic concepts and ion transport principles

Module 2: Electro-chemistry modelling

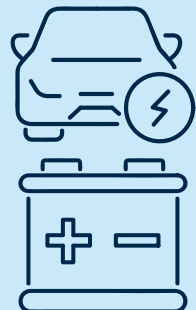
- Introduction of the main approaches for battery modelling
- Equations behind main models (ECM, DFN, SPM)
- Hands-on session. Usage of PyBaMM for electro-chemistry modelling

Module 3: Safety on Lithium-Ion Batteries (Cell Level)

- Introduction on safety issues of Lithium Ion Batteries
- Experimental characterization of Thermal Runaway
- How to model Thermal Runaway events (exothermic and gas generation)
- Demonstration of performed 3D simulations (Real examples)
- Hands-on session. Solving TR kinetics

Module 4: Safety on Lithium-Ion Batteries (Module Level) and cooling strategies

- Phenomenon of Thermal Runaway Propagation
- Implementation of Cell-Level knowledge on Thermal Runaway Propagation
- Cooling strategies



WHERE

The modules will be held @Sala
Multimedia - North Area of Energy
Department "Galileo Ferraris"

WHEN

26/11 - 9:00-12:00

27/11 - 9:00-12:00

28/11 - 9:00-12:00

1/12 - 14:00-17:00

2/12 - 14:00-17:00

CONTACTS

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WHO CAN PARTICIPATE

PhD Students from the DISAT, DENERG,
DIMEAS departments are invited to join.

Registration form available on line at:

<https://forms.gle/ty7C2jCrL3fRzD9ZA>

