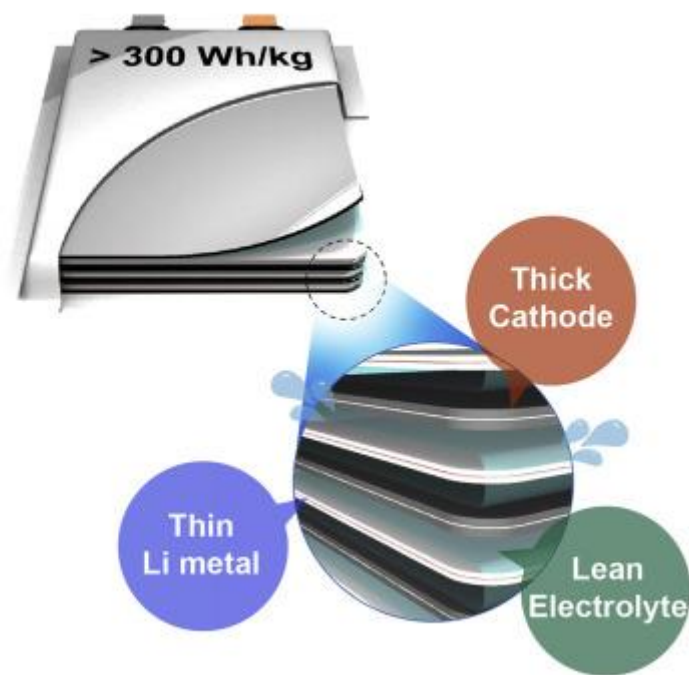


## Batteries, supercapacitors, fuel cells: from design to testing

Teachers : Drs F. LEROUX, M. DUBOIS, N. BATISSE, K. GUERIN

High performing energy storage devices for high-power applications including heavy electric vehicles, energy-efficient cargo ships and locomotives, aerospace and stationary grid system are needed. Such devices require systematic design and fabrication of composite material and conductive polymers. Electrochemical capacitors based on nanostructured carbon can complement or replace batteries in electrical energy storage and harvesting applications, when high power delivery or uptake is needed. Energy storage devices' widespread applications in industrial, hybrid electric vehicles and commodity electronics could be facilitated through careful selection of electrolyte-electrode system. Good understanding of charging mechanism is key to improving device's performance.



This course will consist in 12h of lectures (4\*3h) and 4 h of tutorials given by 4 researchers all working on transdisciplinary projects implying energy storage. Owing to the nonspecialist audience of this proposed course, an application-oriented approach will be adopted and the necessary basics will be provided within each lecture.-

This course will begin by a first **1h lecture given by K. GUERIN ARAUJO DA SILVA**, assistant professor at Clermont Auvergne University, on the different energy storage systems.

In the second lecture, **M. DUBOIS**, Professor at Clermont Auvergne University, will present materials, electrolyte usable in batteries. Recycling will also be discussed.

The third lecture will be made by **F. LEROUX**, CNRS director. A special analysis of electrode materials by EIS (Electrochemical Impedance Spectroscopy) will be detailed.

In the fourth lecture, **N. BATISSE**, assistant professor at Clermont Auvergne University, will present supercapacitors.

In the last lecture, **K. GUERIN ARAUJO DA SILVA** will **detailed fuel cell and testing of all these systems.**

After this series of lectures, during 4h of tutorials, it will be asked to the learners to work in multidisciplinary teams on recent publications dealing with batteries and to reconstitute their work in an oral presentation for the benefit of the whole group.