GREEN COMPUTING

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Lecturers: **Ian O CONNOR, Alberto BOSIO**

| Lecturers : 16.0 | TC : 0.0 | PW : 8.0 | Autonomy : 0.0 | Study : 4.0 | Project : 0.0 | Language : FR

Objectives

This course aims to study the execution of applications on computing architectures from the points of view of functionality, performance and energy efficiency. In this context, parallel hardware architectures (multi-core processors, SIMD machines and GPUs), hardware communications resources (bus and network) as well as the efficient deployment of applications on these hardware resources will be discussed: task placement, hardware / software partitioning and matching algorithm requirements to architecture resources. Techniques for estimating energy consumption will be presented and will make it possible to estimate the cost of memory access, calculations and communications.

Keywords : Energy consumption in digital electronic systems, Low power design techniques, Parallel computing architectures, Application deployment, matching algorithm requirements to architecture resources

Programme	Principles of hardware/software partitioning and processor sizing Multi-core architectures and programming Strategies for deploying tasks and reducing consumption Energy cost of inter-core communication or distributed computing Multi-level abstraction energy estimation of software execution Personal work and study class: analysis of energy-efficient supercomputers (green500.org) Practical work (2 4-hour sessions): programming an image filter on an embedded GPU,
Learning outcomes	• Understand the issues and origins of energy consumption in computing architectures • Be able to evaluate energy consumption in processors • Be able to optimize the programming of algorithms on processors to minimize energy consumption
Independent study	Objectifs : Analysis of energy-efficient supercomputers (green500.org) Méhodes : Analysis (in groups of 2) of a supercomputer chosen from the green500.org list, comparison with supercomputers from the top500.org list, written report and oral defense
Core texts	
Assessment	2 hour written test without documents (50%) Personal work and study class (25%) Practical work (25%)