

PhD Physics course at Bari University (XXXII Cycle)

Title	Introduction to Parallel Computing and GPU Programming using CUDA
Proponent	Dr. Felice Pantaleo (CERN)
# CFU (1 CFU = 8 hours)	2 CFU (16 hours)
Schedule	APRIL -MAY 2017
Brief Summary of the course	<p>While the computing community is racing to build tools and libraries to ease the use of these heterogeneous parallel computing systems, effective and confident use of these systems will always require knowledge about the low-level programming interfaces in these systems. This course is designed to introduce through examples and hands-on exercises, based on the CUDA programming language, the three abstractions that make the foundations of parallel programming using GPUs:</p> <ul style="list-style-type: none"> •Thread hierarchy •Synchronization •Memory hierarchy/Shared Memory
Programme	<p>1) Moore's Law, Power wall mitigation, Embarrassingly parallel problems, Flynn's Taxonomy, Contention, Data Hazards, Amdahl's Law (4 hours)</p> <p>2) Parallel computing architectures, Heterogeneous computing, Throughput, CUDA, Memory Hierarchy, Threads Hierarchy, CUDA Kernel development, Memory Management (4 hours)</p> <p>3) Applications of parallel programming in High Energy Physics: tracking, clustering, fitting and pattern recognition (4 hours)</p>
Recommended texts	<p>1) Material provided by the lecturer</p> <p>2) Programming Massively Parallel Processors, 2nd Edition, David B. Kirk, Wen-mei Hwu</p>
Assessment methods	<p>Theory introduction with hands-on exercises. For reference: https://agenda.infn.it/conferenceDisplay.py?confId=9856</p>