Day 1 (Monday)

Session 1 / 9:30 am – 1:00 pm (2 h lectures, 1 h practical)
1. Introduction to parallel architectures, algorithms design and performance parameters
2. Introduction to the MPI programming model
3. Practical: How to compile and run MPI applications

Session 2 / 2:00 pm – 5:30 pm (2h lectures, 1h practical)
1. MPI: Point-to-point communication, collective communication
2. Practical: Simple matrix computations
3. MPI: Blocking and non-blocking communications

Day 2 (Tuesday)

Session 1 / 9:30 am - 1:00 pm (1.5 h lectures, 1.5 h practical)
1. MPI: Collectives, Communicators, Topologies
2. Practical: Heat equation example

Session 2 / 2:00 pm - 5:30 pm (1.5 h lectures, 1.5 h practical)
1. Introduction to Paraver: tool to analyze and understand performance
2. Practical: Trace generation and trace analysis

Day 3 (Wednesday)

Session 1 / 9:30 am - 1:00 pm (1 h lecture, 2h practical)
1. Parallel debugging in MareNostrumIII, options from print to Totalview
2. Practical: GDB and IDB
3. Practical: Totalview
4. Practical: Valgrind for memory leaks

Session 2 / 2:00 pm - 5:30 pm (2 h lectures, 1 h practical)
1. Shared-memory programming models, OpenMP fundamentals
2. Parallel regions and work sharing constructs
3. Synchronization mechanisms in OpenMP
4. Practical: heat diffusion in OpenMP

**Day 4 (Thursday)**

Session 1 / 9:30am – 1:00 pm (2 h practical, 1 h lectures)
1. Tasking in OpenMP 3.0/4.0/4.5
2. Programming using a hybrid MPI/OpenMP approach
3. Practical: multisort in OpenMP and hybrid MPI/OpenMP

Session 2 / 2:00pm – 5:30 pm (1.5 h lectures, 1.5 h practical)
1. Parallware: guided parallelization
2. Practical session with Parallware examples

**Day 5 (Friday)**

Session 1 / 9:30 am – 1:00 pm (2 hour lectures, 1 h practical)
1. Introduction to the OmpSs programming model
2. Practical: heat equation example and divide-and-conquer

Session 2 / 2:00pm – 5:30 pm (1 h lectures, 2 h practical)
1. Programming using a hybrid MPI/OmpSs approach
2. Practical: heat equation example and divide-and-conquer

**END of COURSE**
Barcelona Supercomputing Center - Centro Nacional de Supercomputación