

## 5-Day-Course — *Beginners* — 1st day (Monday)

### Message Passing Interface (MPI-1, part 1)

- 8:30 **Registration**
- 9:00 **Introduction** [1] (talk)
- 9:10 **Parallel Architectures and Programming Models** [2] (talk)
- 10:10 **Coffee**
- 10:25 **MPI-1 – Introduction to the Message Passing Interface** [3+3a] (talk)
- 10:25 **Chap. 1 MPI Overview** (talk)
- 10:45 **Chap. 2 MPI Process model** (talk+practical)
- 12:00 **Lunch**
- 13:00 **Chap. 3 Messages and Point-to-Point Communication** (talk+practical)
- 14:15 **Coffee**
- 14:30 **Chap. 4 Non-Blocking Communication** (talk+practical)
- 15:45 **Coffee**
- 16:00 **Chap. 5 Derived Datatypes** (talk+practical)
- 17:30 **End**



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## 5-Day-Course — *Beginners* — 2nd day (Tuesday)

### Message Passing Interface (MPI-1, part 2, and MPI-2 for beginners)

- 8:30 **Access to the federal high-performance computing-centers** [9] (talk)
- 9:00 **Chap. 6 Virtual Topologies** [3, continued] (talk+practical)
- 10:10 **Coffee**
- 10:25 **Chap. 7 Collective Communication** (talk+practical)
- 11:00 **Coffee**
- 11:15 **Chap. 8 Other MPI-1 features** (talk)
- 11:40 **Heat conduction program, a parallelization example with MPI** [6] (talk)
- 12:00 **Lunch**
- 13:00 **Domain decomposition of structured and unstructured grids** [31] (talk)
- 14:00 **Coffee**
- 14:15 **Load balancing** [32+32a] (talk) German: English:
- 14:45 **MPI-2 overview** [10] (talk)
- 15:15 **Coffee**
- 15:30 **MPI-2 one-sided Communication** [12+12a] (talk+practical)
- 16:45 **Parallel debugging** [5] (talk+practical)
- 17:30 **End**



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## 5-Day-Course — *Beginners* — 3rd day (Wednesday)

### Shared Memory Parallelization with OpenMP

- 8:30 **OpenMP – Overview and execution model** [7+7a] (talk+practical) 
- 9:30 **OpenMP – Work sharing directives** (talk+practical) 
- 10:30 **Coffee**
- 10:45 **OpenMP – Data environment** (talk+practical) 
- 11:30 **OpenMP – Summary and Pitfalls** (talk) 
- 12:00 **Lunch**
- 13:00 **OpenMP – Tools** [21] (talk)  
- 13:20 **Verifying an OpenMP parallelization with the Intel Thread Checker** [8a] (t+p) 
- 14:20 **Coffee**
- 14:35 **OpenMP – heat example** [7, slide 84ff] (practical) 
- 15:35 **Coffee**
- 15:50 **OpenMP – Performance tuning and OpenMP** [22] (talk+practical) 
- 17:00 **Services at HLRS** [18a] (talk) 
- 17:30 **End**



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## 5-Day-Course — *Advanced* — 4th day (Thursday)

### Advanced MPI and OpenMP programming

- 8:30 **Parallel programming models on hybrid systems / MPI + OpenMP** [23] (talk)  
- 9:45 **Coffee**
- 10:00 **OpenMP on clusters or clusters of SMP nodes – The Intel® Cluster OpenMP** [20a] (talk+practical)    
- 11:00 **VAMPIR and PARAVR, tools for performance analysis** [16, 17] (talk+practical)
- 12:00 **Lunch**
- 13:00 **MPI-2 parallel file I/O (basics)** [11+11a] (talk+practical)    
- 14:00 **Coffee**
- 14:15 **MPI-2 parallel file I/O (fileviews)** (talk+practical) 
- 15:15 **MPI-2 parallel file I/O (access methods)** (talk) 
- 15:45 **Coffee**
- 16:00 **Memory Checking & Single-Processor Optimization using Valgrind** [05b](talk)
- 16:45 **Virtual reality based visualization** [30] (talk and online demo in the "cave")  
- 17:30 **End**



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## 5-Day-Course — *Advanced* — 5th day (Friday)

### Parallelization in General

- 8:30 **Parallelization of Explicit and Implicit Solvers** [38a] (talk) 
- 9:45 **Coffee**
- 10:00 **PETSc Tutorial** [41] (talk)   
- 10:45 **Laplace-Example with PETSc** [42a+c] (talk+practical)  
- :--- **Laplace-Example with MPI** [42b] (handouts only)
- 11:30 **Numerical and parallel libraries** [33] (talk) 
- 12:00 **Lunch**
- 13:00 **Parallel numerics (part1)** [34] (talk) 
- 13:45 **Coffee**
- 14:00 **Parallel numerics (part2)** (talk) 
- 14:45 **Coffee**
- 15:00 **Particle based domain decomposition** [35] (talk) 
- :--- **Object oriented parallel programming with C++** [36] (handouts only) 
- 15:45 **Summary and Q&A** (talk+discussion) 
- 16:30 **End**



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