



***Introduction via Applications to Calculations Using  
High Performance Computers***

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The course will concern the way of work, basic tools and libraries used on HPC. We will stress on the parallel programs. We will show the selected FEA (Finite Element Analysis) and MD (Molecular Dynamics) programs. The students will perform several exercises on a computing cluster in ICM and a new computing cluster in IPPT. They will write simple FEA programs supplied with parallel sparse solver. Since the course will comprise of several exercises on remote computers the participants should have Linux and/or Windows laptops with WiFi cards. In the case of Windows, the X-Cygwin should be installed.

**Main topics:**

1. Structure of nonlinear and linear FEA programs.
2. Elements of MPI.
3. Linear systems of equations solvers.
4. Examples of nonlinear problems and solution algorithms.
5. Domain decomposition.
6. Particle methods.

Projects and exercises: implementation of linear and nonlinear problems employing a sparse solver.

**The total number of lecture hours: 30, laboratory exercises: 8 hours, self-teaching: 60, direct tutoring and consultations: 15 hours.**

**ECTS Points: 4**