

Module Nr.	Credits	Workload	Semester	Frequency	Duration
SE-O-9	6 CP	180 h	3	Yearly (WS)	1 Semester
<b>Courses</b>			<b>Contact time</b>	<b>Self-study</b>	<b>Group size</b>
High-Performance Computing on Clusters			4 h/week	120 h	---
<b>High-Performance Computing on Clusters</b>					
<b>Learning outcomes</b>					
After successfully completing the module the students					
<ul style="list-style-type: none"> <li>• are enabled to design and create programs for parallel computing clusters</li> <li>• can critically evaluate distributed-memory systems and programming patterns</li> <li>• can assess the mathematical properties of iterative solvers and their scalability</li> </ul>					
<b>Content</b>					
<p>The lecture deals with the parallelization on cluster computers. Distributed-memory programming concepts (MPI) are introduced and best-practice implementation is presented based on applications from scientific computing including the finite element method and machine learning.</p> <p>Special attention is paid to scalable solvers for systems of equations on distributed-memory systems, focusing on iterative schemes such as simple splitting methods (Richardson, Jacobi, Gauß-Seidel, SOR), Krylov-methods (Gradient descent, CG, BiCGStab) and, in particular, the multigrid method. The mathematical foundations for iterative solvers are reviewed, suitable object-oriented interface structures are developed and an implementation of these solvers for modern parallel computer architectures is developed.</p> <p>Numerical experiments and self-developed software implementations are used to discuss and illustrate the theoretical results.</p>					
<b>Teaching Methods / Language</b>					
Lecture (2h / week), Computer lab (2h / week) / English					
<b>Modes of assessment</b>					
Written examination (120 min)					
<b>Requirements for the award of credit points</b>					
Passing the written examination					
<b>Module applicability (in other study programs)</b>					
Master Computational Engineering, Master Civil Engineering, Master Applied Informatics					
<b>Weight of the mark for the final score</b>					
5 %					
<b>Module coordinator and lecturer(s)</b>					
Jun.-Prof. Dr. Andreas Vogel					
<b>Other information</b>					