TECHNISCHE HOCHSCHULE LÜBECK

Module: Intro to Parallel Programming, HPC and Simulations

Level	Bachelor	**Short Name**	HPC
Responsible Lecturers	Maurer, Maurice, Dr.		
Department, Facility	Electrical Engineering and Computer Science		
Course of Studies	Computer Science/Software Engineering, Bachelor		
Compulsory/elective	Elective	**ECTS Credit Points**	5
Semester of Studies	(Unspecified)	**Semester Hours per Week**	4
Length (semesters)	1	**Workload (hours)**	150
Frequency	SuSe	**Presence Hours**	60
Teaching Language	English	**Self-Study Hours**	90

The following section is filled only if there is **exactly one** module-concluding exam.

Exam Type	Project Work	**Exam Language**	German/English
Exam Length (minutes)		**Exam Grading System**	One-third Grades
Learning Outcomes	Students can: • Apply OpenMP directives to parallelize C code on shared-memory systems • Develop MPI programs for distributed computing architectures • Implement CUDA kernels for GPU-accelerated computations • Utilize SLURM schedulers to execute parallel programs on HPC clusters • Accelerate scientific simulations through parallel programming techniques • Analyze the performance of parallel programs and identify bottlenecks		
Participation Prerequisites			

The previous section is filled only if there is **exactly one** module-concluding exam.

Consideration of Gender and Diversity Issues	✘ Use of gender-neutral language (THL standard) ✘ Target group specific adjustment of didactic methods ✘ Making subject diversity visible (female researchers, cultures etc.)
Applicability	This module is self-contained and can also be applied in the natural sciences for scientific simulations.
Remarks	Experience in the C programming language is recommended

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Module Course: HPC (lecture)

(of Module: Intro to Parallel Programming, HPC and Simulations)

Course Type	Lecture	**Form of Learning**	Online supported with presence hours
Mandatory Attendance	no	**ECTS Credit Points**	3
Participation Limit	12	**Semester Hours per Week**	2
Group Size	12	**Workload (hours)**	75
Teaching Language	English	**Presence Hours**	30
Study Achievements ("Studienleistung", SL)		**Self-Study Hours**	45
SL Length (minutes)		**SL Grading System**	

The following section is filled only if there is a course-specific exam.

Exam Type		**Exam Language**	
Exam Length (minutes)		**Exam Grading System**	
Learning Outcomes			
Participation Prerequisites			

The previous section is filled only if there is a course-specific exam.

Contents	OpenMP, MPI, CUDA, SLURM, HPC, Simulations
Literature	Mattson, T.G: The OpenMP Common Core: Making OpenMP Simple Again, 2019 Gropp, W.: Using MPI: Portable Parallel Programming with the Message-Passing Interface, 2014Kirk, D.B.: Programming Massively Parallel Processors: A Hands-on Approach, 2023
Remarks	

TECHNISCHE HOCHSCHULE LÜBECK

Module Course: HPC Practical Training

(of Module: Intro to Parallel Programming, HPC and Simulations)

Course Type	Practical Training	**Form of Learning**	Online supported with presence hours
Mandatory Attendance	no	**ECTS Credit Points**	2
Participation Limit	12	**Semester Hours per Week**	2
Group Size	12	**Workload (hours)**	75
Teaching Language	English	**Presence Hours**	30
Study Achievements ("Studienleistung", SL)		**Self-Study Hours**	45
SL Length (minutes)		**SL Grading System**	
The following section is filled only if there is a course-specific exam.			
Exam Type		**Exam Language**	
Exam Length (minutes)		**Exam Grading System**	
Learning Outcomes			
Participation Prerequisites			
The previous section is filled only if there is a course-specific exam.			
Contents	Practical Training to apply the content of the lecture		
Literature			
Remarks			