RENCANA PEMBELAJARAN SEMESTER
PROGRAM STUDI PASCA SARJANA TERAPAN TEKNIK INFORMATIKA DAN KOMPUTER
DEPARTEMEN TEKNIK INFORMATIKA DAN KOMPUTER

Kode	VI203201	Mata Kuliah	High Performance Computing
Bobot SKS	2	Semester	3
Kelompok MK	MK Keahlian	Jam/minggu	2
Tim Pengampu MK	Dadet Pramadihanto		

Capaian Pembelajaran	Students are able to (understand, apply and analyze) and (valuing and organizing) the high performance computing technologies including: Parallel Processing Concepts and Architectures, Design and implementation of parallel computing facilities based on Linux Clustering, Fundamental Design Issues in Parallel Computing, Fundamental Limitations Facing Parallel Computing, developing Some parallel programming applications, and Advanced Topics on HPC.
Pokok Bahasan	1. Parallel Processing Concepts: Levels of parallelism (instruction, transaction, task, thread, memory, function), Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc), Architectures: N-wide superscalar architectures, multi-core, and multi-threaded; 2. Design and implementation of parallel computing facilities based on Linux Clustering. Parallel programming based on Message Passing Interface (MPI) and threaded programming based on OpenMP; 3. Fundamental Design Issues in Parallel Computing: Synchronization, Scheduling, Job Allocation, Job Partitioning, Dependency Analysis, Mapping Parallel Algorithms onto Parallel Architectures, Performance Analysis of Parallel Algorithms ; and Fundamental Limitations Facing Parallel Computing: Bandwidth Limitations, Latency Limitations, Latency Hiding/Tolerating Techniques and their limitations; 4. Some parallel programming applications: linear algebra, differential equation, graph theory, automata, Fourier transform for signal and image processing, etc. 5. Advanced Topics: Petascale Computing, Optics in Parallel Computing, Quantum Computers, Recent developments in Nanotechnology and its impact on HPC.
Referensi	1. Victor Eijkhout, Edmond Chow, Robert van de Geijn, 2015. Introduction to High Performance Scientific Computing, 2nd edition. 2. Victor Eijkhout, 2015, Parallel Computing for Science and Engineering. 3. NVIDIA, 2015, CUDA C Programming Guide, ver. 7.5.
MK Prasyarat	1. Advanced Mathematics, Algorithm and Programming, 2. Network Management and Security, 3. Modeling and Simulation
Media Pembelajaran	Software: Linux, MPI, OpenMP, Nvidia CUDA. Hardware: Embedded PC cluster, Nvidia CUDA based card. Presentation: PC/Laptop, LCD Projector, presentation software
Asesmen (%)	UTS=20 %, UAS=25 %, Tugas{Presentation, Writing Essay, Solving Problems}=35 %, Sikap=10 %

Minggu Ke-	Sub Capaian Pembelajaran MK (Kemampuan Akhir Yang Direncanakan)	Bahan Kajian (Materi Pembelajaran)	Bentuk Pembelajaran	Waktu Belajar (menit)	Kriteria Asesmen (Indikator)	Bentuk Asesmen	Bobot
(1)-(2)	Students are able to remember, understand, apply and analyze the Parallel Processing Concepts: Levels of parallelism, Models, and Architectures;	o Levels of parallelism (instruction, transaction, task, thread, memory, function), o Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation, etc.), o Architectures: N-wide superscalar architectures, multi-core, and multi-threaded;	o Reading papers and books related to the topics o Lectures o Discussions o Presentation o Writing essay related to the topics	TM: 2x100 menit TT : 2x100 menit BM: 2x120 menit	o **Correctly identifying, describe and explain** about the level of parallelism. o **Correctly identifying, describe and explain** the parallel model and which is better based on references, proves and evidences. o **Correctly identifying, describe and explain** about parallel architectures and show the bennefits of each model based on references, proves and evidences.	Writing summary of papers and books of the weekly topics, Attend and actively participate the discussion in the class, Prepare and make presentation of the given topics, Submit solution of the given problems, Writing essay to value and put together different values of the given topics.	15%
(3)-(6)	Student are able to Design and implement a parallel computing facilities. Student are able to develope Parallel program based on MPI and OpenMP;	o Design and implement of parallel computing facilities based on embedded PC Linux Clustering. o Message Passing Interface (MPI) o Parallel Programming based on Message Passing Interface (MPI) o OpenMP o Threaded Parallel Programming based on OpenMP	o Reading papers and books related to the topics o Lectures o Discussions o Presentation o Writing essay related to the topics	TM: 4x100 menit TT : 4x100 menit BM: 4x120 menit	o **Examine, identify and make inferences** on the requirement of the designing parallel computing facilities. o **Correctly identifying, describe and explain** about MPI/OpenMP and show the bennefits of the models based on references, proves and evidences. o **Correctly develope** a programming the MPI/OpenMP and **analyze** them based on proves and evidences.	Writing summary of papers and books of the weekly topics, Attend and actively participate the discussion in the class, Prepare and make presentation of the given topics, Submit solution of the given problems, Writing essay to value and put together different values of the given topics.	15%
(7)-(8)	Students are able to remember, understand, apply and analyze the Fundamental Design Issues in Parallel Computing.	o Synchronization o Scheduling o Job Allocation o Job Partitioning o Dependency Analysis o Mapping Parallel Algorithms onto Parallel Architectures o Performance Analysis of Parallel Algorithms	o Reading papers and books related to the topics o Lectures o Discussions o Presentation o Writing essay related to the topics	TM: 2x100 menit TT : 2x100 menit BM: 2x120 menit	o **Correctly identifying, describe and explain** about Fundamental Design Issues in Parallel Computing o **Correctly value and put together different values** of the Fundamental Design Issues in Parallel Computing.	Writing summary of papers and books of the weekly topics, Attend and actively participate the discussion in the class, Prepare and make presentation of the given topics, Submit solution of the given problems, Writing essay to value and put together different values of the given topics.	20%
(9)	**Ujian Tengah Semester (UTS)**						
(10)-(11)	Students are able to remember, understand, apply and analyze the Fundamental Limitations Facing Parallel Computing	o Bandwidth Limitations o Latency Limitations o Latency Hiding/Tolerating Techniques and their limitations;	o Reading papers and books related to the topics o Lectures o Discussions o Presentation	TM: 2x100 menit TT : 2x100 menit BM: 2x120 menit	o **Correctly identifying, describe and explain** about Fundamental Limitations Facing Parallel Computing o **Correctly value and put together different values** of the	Writing summary of papers and books of the weekly topics, Attend and actively participate the discussion in the class, Prepare and make presentation of the given topics,	15%

			o Writing essay related to the topics		Fundamental Limitations Facing Parallel Computing	Submit solution of the given problems, Writing essay to value and put together different values of the given topics.	
(12)-(15)	Students are able to remember, understand, develope and analyze Some parallel programming applications.	o Linear algebra o Differential equation o Graph theory o Automata o Fourier transform for signal and image processing, etc.	o Reading papers and books related to the topics o Lectures o Discussions o Presentation o Writing essay related to the topics	TM: 4x100 menit TT : 4x100 menit BM: 4x120 menit	o **Correctly develope** several mathematical models in parallel programs and **analyze** them based on proves and evidences. o **Correctly value and put together different values** of the implementation mathematical models in parallel programs.	Writing summary of papers and books of the weekly topics, Attend and actively participate the discussion in the class, Prepare and make presentation of the given topics, Submit solution of the given problems, Writing essay to value and put together different values of the given topics.	20%
(16)-(17)	Students are able to remember, understand, apply and analyze the Advanced Topics on HPC:	o Petascale Computing o Optics in Parallel Computing o Quantum Computers o Recent developments in Nanotechnology and its impact on HPC.	o Reading papers and books related to the topics o Lectures o Discussions o Presentation o Writing essay related to the topics	TM: 2x100 menit TT : 2x100 menit BM: 2x120 menit	o **Correctly identifying, describe and explain** about the Advanced Technologies on High Performance Computing o **Correctly value and put together different values** of the Advanced Technologies on High Performance Computing.	Writing summary of papers and books of the weekly topics, Attend and actively participate the discussion in the class, Prepare and make presentation of the given topics, Submit solution of the given problems, Writing essay to value and put together different values of the given topics.	15%
(18)	**Ujian Akhir Semester (UAS)**						

Keterangan:
TM : Tatap Muka
TT : Tugas Terstruktur
BM : Belajar Mandiri