Course Contents:

Module 1:	**Introduction** What is parallel computing? The scope of parallel computing? Issues in parallel computing. A taxonomy of parallel architecture, Dynamic interconnection networks, static interconnection networks, Routing mechanism for static network. Communication cost in static interconnection network.	7
Module 2:	**Parallel programming models and paradigms.** Introduction, A cluster computer and architecture, parallel applications and development, code granularity and level of parallelism, parallel programming models and tools, methodical design of parallel algorithm, parallel program paradigm, programming skeleton and templates	6
Module 3:	**Performance and scalability of parallel systems** Performance Metrics for parallel systems. The effect of Granularity and Data Mapping on Performance. The Scalability of parallel systems, Isoefficiency metric of scalability, sources of parallel overhead, Minimum execution time and minimum cost-optimal execution time.	6
Module 4:	**Tools for parallel programming** OpenMP, MPI, CUDA/OpenCL, Chapel, etc. Thread basics ,Work Sharing constructs, Scheduling, Reduction, Mutual Exclusion Synchronization & Barriers, The MPI Programming Model, MPI Basics, Global Operations , Asynchronous Communication, Modularity, Other MPI Features Performance Issues	7
Module 5:	**Hybid parallelism and accelerators.** Basic of GPGPU, CUDA Programming model, CUDA memory type CUDA and/or OpenCL for GPGPU hardware, case study, MPI + CUDA.	7
Module 6:	**Parallel Algorithms** Dense matrix algorithms, sorting, graph algorithms.	6