RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Departmental Elective – CS802 (C) High Performance computing

Theory

1. Introduction to modern processors-: General Purpose cache based architecture-performance metric and bench marks, Moors Law, pipelining, super clarity, SIMD. Memory Hierarchies, Multi core processors, Multi threaded processors, Vector processors- Design principle , Max performance estimates, programming for vector architecture. Basic Optimizations for serial codes:- Scalar profiling, common sense optimizations, Simple measures and their impacts, role of compilers, C++ optimizations.

2. Data access optimizations: balance analysis and light speed estimates, storage order, Algorithm classifications and assess optimizations, case studies for data access optimizations. Parrall Computers: Shared memory computers, Distributed memory computers, hybrid systems, Network computers.

3. Basics of parallel computing: data and functional parallelism, parallel scalability- laws, metrics, factors, efficiency and load imbalance. Shared memory parallel programming with Open MP: Parallel execution, data scoping, work sharing using loops, synchronization, Reductions, loop scheduling and Tasking.

4. Efficient Open MP Programming: Program profiling, Performance pitfalls, improving the impact of open MP work sharing constructs, determining overheads for short loops, Serilisation and false sharing.

5. Distributed Memory parallel programming with MPI: Message passing, Message and point to point communication, collective communication, non blocking point-to-point communication, virtual topologies. Efficient MPI Programming: MPI performance tools, communication parameters, impact of synchronizations sterilizations and contentions, reductions in communication overhead.

Text Books :

1. George Hager and Gerhard Wellein , " Introduction to high performance Computing for scientists and engineers", CRC Press
2. Charles Severance, Kevin Dowd, "High Performance Computing", 2nd Edition, O'Reilly