CS010 801 : HIGH PERFORMANCE COMPUTING

Objectives

• To design a powerful and cost-effective computer system.

• To provide the basic concepts of parallel processing on high performance

computers.

Module I (15 hours)

Introduction to parallel processing - Trends towards parallel processing - Parallelism in

uniprocessor - Parallel computer structures-Architecture classification schemes ,Amdahl's

law,Indian contribution to parallel processing

Module II (15 hours)

Principles of pipelining and vector processing - Linear pipelining - Classification of pipeline

processors - General pipelines - Instruction and Arithmetic pipelines –Design of Pipelined

instruction unit-Principles of Designing Pipeline Processors- Instruction prefetch and branch

handling- Data Buffering and Busing Structure-Internal forwarding and register taggingHazard detection and Resolution,Dynamic pipelines and Reconfigurability

Module III (15 hours)

Array processors - SIMD array processors - Interconnection networks - Static vs dynamic

networks - mesh connected networks - Cube interconnection networks - Parallel algorithms

for array processors - SIMD matrix multiplication-Parallel sorting on array processors Associative array processing - Memory organization.

Module IV (15 hours)

Multiprocessor architectures and Programming - Loosely coupled and Tightly coupled

multiprocessors - Interconnection networks - Language features to exploit parallelism -Inter

process communication mechanism-Process synchronisation mechanisms,synchronization

with semaphores.

Module V (15 hours)

Dataflow computers - Data driven computing and Languages, Data flow computers

architectures - Static data flow computer , Dynamic data flow computer ,Data flow design

alternatives.

References:

1. Computer Architecture & Parallel Processing - Kai Hwang & FayeA.Briggs,McGraw Hill
2. Computer architecture A quantitative approach - John L Hennessy and David A. Patterson-ELSEVIER,Fourth Edition
3. Elements of Parallel computing - V. Rajaraman - PHI
4. Super Computers - V. Rajaraman - Wiely arstern
5. Parellel Processing for Super Computers & AI Kai Hwange & Douglas Degneot Mc Graw Hill
6. Highly parallel computing - George S. Almasi,Allan Gottlieb. - Benjamin Cumings Publishers.
7. HIgh Performance Computer Architecture - Harold S. Stone, Addison Wesley.
8. Advanced Computing- Vijay P.Bhatkar, Asok V.Joshi, Arirban Basu, Asok K.Sharma.