CS6801 MULTI-CORE ARCHITECTURES AND PROGRAMMING   **L T P C**
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OBJECTIVES:
The student should be made to:

· Understand the challenges in parallel and multi-threaded programming.

· Learn about the various parallel programming paradigms, and solutions.

UNIT I MULTI-CORE PROCESSORS   9
Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks -
Symmetric and Distributed Shared Memory Architectures – Cache coherence - Performance
Issues –Parallel program design.

UNIT II PARALLEL PROGRAM CHALLENGES   9
Performance – Scalability – Synchronization and data sharing – Data races – Synchronization
primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication
between threads (condition variables, signals, message queues and pipes).

UNIT III SHARED MEMORY PROGRAMMING WITH OpenMP   9
OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs –
Libraryfunctions – Handling Data and Functional Parallelism – Handling Loops - Performance
Considerations.

UNIT IV DISTRIBUTED MEMORY PROGRAMMING WITH MPI   9
MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and
Collective communication – MPI derived datatypes – Performance evaluation

UNIT V PARALLEL PROGRAM DEVELOPMENT   9
Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and
comparison.

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:

· Program Parallel Processors.

· Develop programs using OpenMP and MPI.

· Compare and contrast programming for serial processors and programming for parallel
processors.

TEXT BOOKS:
1. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan-Kauffman/Elsevier, 2011.
2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris",
Pearson, 2011 (unit 2)
REFERENCES:
1. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.
2. ShameemAkhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.