CSE3111 : Parallel Computing : Advances

Programme: B.Tech. (CSE)	Year: III		Semester: I
Course : Program Elective	Credits : 3		Hours : 40

Course Context and Overview:

Parallel computers provides a platform to solve a problem with multiple computers or computer with multiple processing element in order to obtain faster results. This course provides overview of design, engineering and analysis of modern parallel computers.

Prerequisites Courses: Computer Organization and Architecture, CSE216

Course outcomes(COs):

On completion of this course, the students will have the ability to:
CO1: Understands parallel hardware constructs
CO2: Understands design and performance issues in parallel computer
CO3: Understands different programming model for parallel computer
CO4: Understands memory and cache architecture for parallel computer
CO5: Understands recent trends in the area of parallel computer

Course Topics:

Topics	Lecture Hours
UNIT – I : Introduction	
Flynn's taxonomy, Sequential performance, Performance metrics for parallel architecture, Scalability, Performance versus efficiency	4
UNIT – II : Parallel Architecture and Programming Models	
Challenges; Instruction, data and thread-level parallelism; Classes of parallel computers, Communication models: Shared memory and Message passing; High-level parallel programming models: Task-parallel, Data-parallel, MapReduce, Pipeline-parallel	12
UNIT – III :Memory Architecture and Synchronization	
Cache coherence: Snooping-Based, Directory-Based; Consistency models; Cache Architecture; Memory Architecture; Thread-Level Speculation and Transactional Memory	12
UNIT – IV : Specialized and Heterogeneous Architecture	
Vector processors and GPUs; Clusters, Specialized compute units; Multi-Core and Multi-Threading; Interconnections network; Many-Core	13

Textbook references:
Text Book:

1.   David E. Culler and Jaswinder Pal Singh, with Anoop Gupta., *"Parallel Computer Architecture": A Hardware/Software Approach*. Morgan Kaufmann, 1998.
2.   Kai Hwang, *"Advanced Computer Architecture", Parallelism, Scalability, Programmability*, 2nd edition, Mc Graw Hill, 2011.
3.   Michael J. Quinn. "*Parallel Programming in C with MPI and Open MP"*. McGraw Hill, 2003.
4.   J.L. Hennessey & D.A. "*Patterson Computer Architecture": a Quantitative Approach*, 5th Edition, Morgan Kaufmann, 2011.

Evaluation Methods:

Item	Weightage
Continuous evaluation (Quiz, Assignment, Attendance etc.)	20%
Term Paper	10%
Midterm	25%
Final Examination	45%

Prepared By:
Last Update: 8th April, 2015