NATIONAL INSTITUTE OF TECHNOLOGY

JAMSHEDPUR, JHARKHAND- 831014

Department of Computer Science & Engineering

SPRING SEMESTER 2019-2020

Course Handout

Date: 03-01-2020

Course No.	**:**	**CS601**
Course Title	**:**	**Parallel and Distributed Computing**
Instructor-In-charge	**:**	**SANJAY KUMAR**

Course Description

Introduction to parallel Computing, Solving problems in parallel, Structures of parallel computers, Instruction level parallel processing, Parallel Algorithms, Parallel programming, Operating Systems for parallel computers, Performance Evaluation of parallel computers; Characterization of distributed systems, Design goals, Communication and computer networks, Distributed processing, Distributed operating systems, Client Server Communications, Remote Procedure calls, File Service, Name Service, Distributed transactions and concurrency control, fault tolerance and security. Synchronization & Coordination, Distributed Algorithms, Exposure of parallel and distributed computing tools (Cuda, Swift, Globus, Condor, Amazon AWS, OpenStack, Cilk, gdb, threads, MPICH, MPI,OpenMP, Hadoop), research issues (Parallel and high-performance computers).

Text Books:

1. G. Coulororis, J. Dollimore& T. Kindberg, Distributed Systems: Concepts and Design, Addison Wesley, 3rded, 2001.

2. M. Singhal& N. G. Shivaratri, Advanced Concepts in Operating Systems, McGraw Hill, 1994.

Reference Books:

1. P. K. Sinha Distributed Operating Systems, IEEE Press, 1997.

2. H. F. Jordan, Fundamentals of Parallel Processing, Pearson, 2004.

3. C. Hughes and T. Hughes, Parallel and Distributed Programming Using C++, Pearson, 1sted, 2004.

4. W. Buchanan, Distributed Systems and Networks, Tata McGraw Hill, 2004.

5. P. S. Pacheco, Parallel Programming with MPI, Morgan Kaufmann, 1997

Course Plan

Lecture No.	Topics to be covered	Refer to Chapter see (Book)
1-3	Introduction to parallel and distributed computing, Temporal, Data parallelism , concept of program, process, thread, concept of multi threading ,Data flow computing, application of parallel processing, Instruction level parallel processing	
4-5	Classification of parallel computers (Flynn's, Handler's, structural, based on grain size), interconnection network	
6-8	Parallel computer architecture: Pipeline processing, vector processing, Arrey processing	
9-12	Parallel algorithms: Analysis, combinational circuit, PRAM model, shorting, merge sort, enumeration sort, matrix computation, histogram computation, parallel reduction, quadrature problem.	
13-15	Parallel programming using OPENMP, MPI, High Performance Fortran, Fortran 90, nCUBE C, Occam, C-Linda	
16-19	Operating system for parallel computers: synchronization principle (wait, sole access protocol), multitasking environment: concept of lock, system deadlock, deadlock avoidance, message passing development environment, Unix for multiprocessor system	
20-21	Performance evaluation of parallel computers: metrics for performance evaluation,factor causing parallel overheads, laws for measuring speed up performance (AMDAHL'S. GUSTAFSON'S, SUN AND NI'S LAW), tools for performance measurement (search based tools, visualization)	
22-23	Recent trend in parallel computing : PVM, Grid computing, cluster computing ,IA64 architecture, hyper threading	
24-26	Distributed operating system, Distributed DataBase	
27-28	Client-server communication	
29-31	RPC, DCE, RMI	
32	File Service and Name service	

33-35	Distributed transaction and concurrency control	
36-37	Fault tolerance and security	
38-39	Synchronization and coordination	
40-42	Distributed algorithms	
43-44	Exposure of parallel and distributed computing tools (Cuda, Swift, Globus, Condor, Amazon, AWS, OpenStack, Cilk, gdb, threads, MPICH, Hadoop),	
45	Research issues (Parallel and high-performance computers).	

Evaluation Scheme

S.No.	Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
1	Mid-Term Examination	2 Hrs.	30%		Closed Book
3	End Sem examination	3 Hrs.	50%		Closed Book
4	Assignment		10%		Take Home
5	Teacher Assesment		10%		

Chamber consultation hour: Wednesday [(from (5-6 PM)]

Notices: *All notices regarding the course will be displayed only on the department of Computer Science & Engineering notice board.*

Instructor -In -charge