

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech Computer Science & Engineering		
Course Title	Design and Analysis of Parallel Algorithms		
Course Code	CS618	No. of Credits	3
Course Code of Pre-requisite subject(s)	Knowledge of algorithms and complexity.	Basic knowledge of data structures	Basic knowledge of computer architecture
Session	July 2019	Section (if, applicable)	-
Name of Faculty	Dr. C. Mala	Department	Department of Computer Science & Engineering
Email	mala@nitt.edu	Telephone No.	0431- 2503208
Name of Course Coordinator(s) (if, applicable)	-		
E-mail		Telephone No.	
Course Type	Elective course		
Syllabus (approved in BoS)			
Course Objectives			
<ul style="list-style-type: none"> • To understand different array processors and parallel algorithms for multiprocessor. • To perform the various operations on PRAM model. • To perform merging and sorting operations on different models • To solve linear equations using parallel algorithms for basic problems. • To study graph Algorithms 			
<u>Course Content</u>			
UNIT I			
Structures and algorithms for array processors: SIMD Array Processors, Interconnection networks, Parallel algorithms for Array processors. Multiprocessor architecture-and Interconnection networks- multiprocessor control algorithms- parallel algorithms for multiprocessors.			
UNIT II			
Selection – broadcast- all sums- parallel selection. Searching a random sequence, sorted sequence on PRAM models, Tree and Mesh.			

UNIT III

Merging – A network for merging – merging on PRAM models. Sorting on a linear array, EREW, CREW and CRCW SIMD models, MIMD Enumeration sort.

UNIT IV

Matrix operations- Transposition, Matrix by matrix multiplication, matrix by vector multiplication. Numerical problems- solving systems of linear equations, finding roots of non linear equations on PRAM models.

UNIT V

Graphs – Connected components- dense graphs- sparse graphs. Minimum spanning tree- Solli's algorithm, Biconnected components, Ear decomposition, Directed graphs.

Course Outcomes

Upon completion of the course, the students will be able to:

- Describe the algorithms for array processors
- Develop searching algorithms for various kinds of models.
- Perform efficient sorting operation on different models.
- Solve linear and nonlinear equations using PRAM models.
- Construct graph and find solutions to real world problems.

Text book:

1. Kai Wang and Briggs, "Computer Architecture and Parallel Processing", McGraw Hill, 1985.
2. S. G. Akl, "Design and Analysis of Parallel Algorithms", Prentice Hall Inc., 1992.
3. Joseph Jaja, "An Introduction to parallel Algorithms", Addison Wesley, 1992.

COURSE OBJECTIVES

To learn about parallel computing models, design and analyse parallel algorithms for PRAM machines and Interconnection networks.

COURSE OUTCOMES (CO)

To enable the student to design and analyse parallel algorithms.

Course Outcomes	Aligned Programme Outcomes (PO)							
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8
Ability to design parallel algorithms for SIMD machines	S	B	M	S	B	B	M	B
Ability to design parallel algorithms for MIMD machines	S	B	M	S	B	M	M	B
Ability to analyze parallel algorithms for SIMD and MIMD machines	S	M	S	S	M	S	M	B

S = 0.6 M = 0.4 B = 0.0

COURSE PLAN – PART II

COURSE OVERVIEW

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Contact Hours	Topic	Mode of Delivery
UNIT - I			
1.	1	Introduction to different models of computation	Pen-Board
2.	2	Array Processors	Pen-Board
3.	2	Multiprocessors	Pen-Board
4.	1	Interconnection networks	Pen-Board
5.	2	Shared memory models control and algorithms	Pen-Board
6.	2	Parallel algorithms for Array processors	Pen-Board
UNIT - II			
7.	1	Broadcast, All sums algorithm	Pen-Board
8.	1	Selection Algorithm	Pen-Board
9.	3	Parallel selection	Pen-Board
10.	3	Searching a random sequence on PRAM models, tree and mesh	Pen-Board
11.	1	Searching a sorted sequence on PRAM models tree and mesh	Pen-Board
UNIT - III			
12.	1	Need for Merging , Merging on PRAM models	Pen-Board
13.	3	Merging on PRAM models	Pen-Board
14.	1	ODD EVEN Merge	Pen-Board
15.	3	Sorting on EREW,CREW and CRCW SIMD models	Pen-Board
16.	1	MIMD Enumeration sort	Pen-Board
UNIT - IV			
17.	3	SIMD algorithms for Matrix operations- Transposition	Pen-Board
18.	2	Matrix by matrix multiplication	Pen-Board
19.	1	Matrix by vector multiplication	Pen-Board
20.	2	Numerical problems- solving systems of linear equations	Pen-Board
21.	1	Finding roots of non linear equations on PRAM models	Pen-Board

UNIT - V

22.	3	Graphs algorithms	Pen-Board
23.	2	Finding connected components	Pen-Board
24.	2	Sparse graphs and Dense graphs	Pen-Board
25.	2	Minimum spanning tree	Pen-Board
26.	2	Biconnected components	Pen-Board

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	As per schedule	1 Hour	20
2	Cycle Test 2	As per schedule	1 Hour	20
3	Assignment			10
CPA	Compensation Assessment*	As per schedule	1 Hour	20
4	Final Assessment *	As per schedule	3 Hours	50

*mandatory; refer to guidelines on page 4

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

MIS Feedback

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

Email

COMPENSATION ASSESSMENT POLICY

One Compensation assessment will be conducted for students who were absent for cycle tests due to genuine reasons.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- **Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.

- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

The Course Coordinator is available for consultation from 3pm to 4pm on all working days

FOR APPROVAL

Course Faculty _____

Wes
5/8/19

CC-Chairperson _____

Jhan
5/8/19

HOD _____

Jhan
5/8/19