## Department of Computer Science and Engineering
## National Institute of Technology, Tiruchirappalli

| 1. Course Outline | | | |
|---|---|---|---|
| **Course Title** | **DESIGN AND ANALYSIS OF PARALLEL ALGORITHMS** | | |
| **Course Code** | CSPE12 | | |
| **Programme, Department & Section** | B.Tech. – CSE | **No. of Credits** | 3 |
| **Pre-requisites Course Code** | CSPC29 | **Faculty Name** | Dr. M.Sridevi |
| **E-mail** | msridevi@nitt.edu | **Telephone No.** | 0431 - 2503216 |
| **Course Type** | PE | | |
| **Session in Academic Year** | July - November 2017 Session (Odd Semester) | | |

**2.Course Overview**

- This course mainly describes about the parallel algorithms and analyze of it.

**3. Course Objectives**

- To understand parallel computing algorithms and models
- To analyze parallel algorithms for PRAM machines and various interconnection networks

**4. Course Outcomes (CO)**

- Ability to analyze parallel algorithms for PRAM machines
- Ability to comprehend and apply parallel algorithms to real world applications
- Ability to design and develop optimal parallel algorithms

| 5. Course Outcomes (CO) | Aligned Programme Outcome (PO) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **PO-1** | **PO-2** | **PO-3** | **PO-4** | **PO-5** | **PO-6** | **PO-7** | **PO-8** |
| Ability to analyze parallel algorithms for PRAM machines | S | S | S | S | M | M | B | M |
| Ability to comprehend and apply parallel algorithms to real world applications | S | S | S | S | S | S | B | M |
| Ability to design and develop optimal parallel algorithms | S | S | S | S | S | S | B | M |

S = 0.6 M = 0.4 B = 0.0

| 6. Course Teaching and Learning Activities | | | | | | | |
|---|---|---|---|---|---|---|---|
| **SL.No** | **Title** | **Type** | | **Mode of delivery** | | | |
| | | **L** | **T** | **C&T** | **PPT** | **VL/VC** | **DEMO** |
| **UNIT I** | | | | | | | |
| 1. | Introduction to parallel and sequential algorithms | √ | | √ | | | |
| 2. | Different types of Parallel Computers | √ | | √ | | | |
| 3. | Types of Shared memory SIMD models | √ | | √ | √ | | |
| 4. | Interconnection networks and their types | √ | | √ | √ | | |
| 5. | Classifying MIMD algorithms | √ | | √ | | | |
| 6. | Analysis the algorithm based on running time, processors and used | √ | | √ | | | |
| 7. | Sequential and parallel search algorithms on different SIMD models | √ | | √ | | | |
| 8. | Assignments | | | | | | √ |
| **UNIT II** | | | | | | | |
| 9. | Sequential Selection algorithm | √ | | √ | | | |
| 10. | Parallel Selection algorithm and time complexity analysis | | √ | √ | | | |
| 11. | Broad casting a datum and Computing all sums | √ | | √ | | | |
| 12. | Sequential sorting and Sorting on a linear array | √ | | √ | | | |
| 13. | Sorting using merge split | √ | | √ | | | |
| 14. | Sorting on CRCW model | √ | | √ | | | |
| 15. | Sorting on CREW model | √ | | √ | | | |
| 16. | Sorting on EREW model | √ | | √ | | | |
| 17. | Parallel quick sort | √ | | √ | | | |
| 18. | Hyper Quick sort using hypercube | | | | | | |
| 19. | Assignments | | | | | | √ |
| **UNIT III** | | | | | | | |
| 20. | Matrix operations | √ | | √ | | | |
| 21. | Sequential and parallel matrix multiplication | √ | | √ | | | |
| 22. | Matrix transpose on shuffle network | √ | | √ | | | |
| 23. | EREW matrix transpose | √ | | √ | | | |
| 24. | Matrix multiplication on Mesh network | √ | | √ | | | |
| 25. | Matrix multiplication on Cube | √ | √ | √ | | | |
| 26. | CRCW matrix multiplication | | | | | | √ |

| SL.No | Title | Type | | Mode of delivery | | | |
|---|---|---|---|---|---|---|---|
| | | L | T | C&T | PPT | VL/VC | DEMO |
| 27. | Matrix by vector multiplication on linear array | √ | | √ | | | |
| 28. | Multiplication on tree network | √ | | √ | | | |
| 29. | Assignments | | | | | | √ |
| | **UNIT IV** | | | | | | |
| 30. | Solving linear equation using parallel Gauss-elimination and Gauss - Jordan | √ | | √ | | | |
| 31. | MIMD algorithm for Gauss – Seidel method | √ | | √ | | | |
| 32. | Finding roots of non – linear equations using bisection and Netwon's methods | √ | | √ | | | |
| 33. | Solving partial differential equations | √ | √ | √ | | | |
| 34. | Computing Eigen values and parallel random number genertors | √ | | √ | | | |
| 35. | Assignments | | | | | | √ |
| | **UNIT V** | | | | | | |
| 36. | Computing the connectivity matrix | √ | | √ | | | |
| 37. | Finding connected components using cube SIMD model | √ | | √ | | | |
| 38. | Traversal, Minimal alpha beta tree | √ | | √ | | | |
| 39. | Computing minimum cost spanning tree | √ | | √ | | | |
| 40. | Assignments | | | | | | √ |

| **7. Course Assessment Methods** | | | | |
|---|---|---|---|---|
| **Sl. No.** | **Mode of Assessment** | **Week / Date** | **Duration** | **Marks** |
| 1 | Cycle Test 1 | After completion of two units | 60 minutes | 20 |
| 2 | Cycle Test 2 / Quiz | After completion of four units | 60 minutes | 20 |
| 3 | Programming Assignments | Every Unit | - | 10 |
| 4 | End Semester Exam | As Per Academic Schedule | 3 hours | 50 |
| | | | Total | 100 |

## 8. Essential Readings (Textbooks, Reference books, Websites, Journals, etc.)

**Text Books:**

1. S. G. Akl, "The design and analysis of parallel algorithms", prentice Hall of India, 1989.

**References:**

1. B. Wilkinson and M. Allen, "Parallel Programming - techniques and applications using networked workstations and parallel computers", 2nd Edition, Pearson Education, 2005.
2. Michael J. Quinn, "Parallel computing: throry and practice", Tata mCgraaw Hill, 2003.
3. S. Lakshmivarahan and S.K. Dhall, " Analysis and design of parallel algorithms – Arithemetic and matrix problems", Taat McGraw hill.

## 9. Course Exit Survey

- Feedbacks are collected from the student before end semester examination through MIS or any other standard format followed by the institute.
- Suggestions from the students are incorporated for making the course more understanding and interesting.
- Students, through their Class Representatives, may give their feedback at any time to the course faculty which will be duly addresses.
- The students may also give their feedback during Class Committee Meeting.

## 10. Course Policy (including plagiarism, academic honesty, attendance, etc.)

**Attendance:** Minimum 75% is mandatory to write the end semester examination. Students having attendance 65% to 74% are eligible for the end semester exam only after attending the extra classes and submitting assignments. Students have to redo the course, if they have less than 65% of attendance.

Medical Certificate/ On Duty Certificate should be submitted immediately after rejoining.

## For Senate's Consideration

M.Lidi

**Course Faculty**
(M.SRIDEVI)

**Class Committee Chairperson**

**HOD / CSE**