

## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING - DATA SCIENCE

### Lesson Plan & Work-done Diary for AY: 2026-27, ODD Semester

| Course with Code: Parallel Programming – BDS701 |                      |                                                                                                   |                     | Faculty Name: Dr. Vinod Kumar P |                                 |                | Semester & Section: VII |                          |
|-------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------|---------------------|---------------------------------|---------------------------------|----------------|-------------------------|--------------------------|
| Class No.                                       | Date Planned (DD/MM) | Topics to be covered                                                                              | TLP Planned         | Class No.                       | Date of Conduction (DD/MM/YYYY) | Topics Covered | TLP Executed            | Remarks if any deviation |
| <b>MODULE-1</b>                                 |                      |                                                                                                   |                     |                                 |                                 |                |                         |                          |
| 0                                               |                      | Bridge Class for first two sessions on Parallel computing and its application, OpenMP, CUDA & MPI |                     |                                 |                                 |                |                         |                          |
| 1                                               |                      | Introduction to parallel programming, Parallel hardware and parallel software                     | Chalk and Talk, PPT | 1                               |                                 |                |                         |                          |
| 2                                               |                      | Classifications of parallel computers                                                             | Chalk and Talk, PPT | 2                               |                                 |                |                         |                          |
| 3                                               |                      | SIMD systems, MIMD systems,                                                                       | Chalk and Talk, PPT | 3                               |                                 |                |                         |                          |
| 4                                               |                      | Interconnection networks                                                                          | Chalk and Talk, PPT | 4                               |                                 |                |                         |                          |
| 5                                               |                      | Cache coherence                                                                                   | Chalk and Talk, PPT | 5                               |                                 |                |                         |                          |
| 6                                               |                      | Shared-memory vs. distributed-memory                                                              | Chalk and Talk, PPT | 6                               |                                 |                |                         |                          |
| 7                                               |                      | Shared-memory vs. distributed-memory                                                              | Chalk and Talk, PPT | 7                               |                                 |                |                         |                          |
| 8                                               |                      | Coordinating the processes/threads, Shared-memory                                                 | Chalk and Talk, PPT | 8                               |                                 |                |                         |                          |

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|---|--|---------------------|---------------------|---|--|--|--|--|
| 9 |  | Distributed-memory. | Chalk and Talk, PPT | 9 |  |  |  |  |
|---|--|---------------------|---------------------|---|--|--|--|--|

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| MODULE-2                                        |                           |                                        |                     |                                 |                                 |                |                         |                          |
| 10                                              |                           | GPU programming                        | Chalk and Talk, PPT | 10                              |                                 |                |                         |                          |
| 11                                              |                           | Programming hybrid systems             | Chalk and Talk, PPT | 11                              |                                 |                |                         |                          |
| 12                                              |                           | MIMD systems, GPUs, Performance        | Chalk and Talk, PPT | 12                              |                                 |                |                         |                          |
| 13                                              |                           | Speedup and efficiency in MIMD systems | Chalk and Talk, PPT | 13                              |                                 |                |                         |                          |
| 14                                              |                           | Amdahl's law                           | Chalk and Talk, PPT | 14                              |                                 |                |                         |                          |
| 15                                              |                           | Scalability in MIMD systems            | Chalk and Talk, PPT | 15                              |                                 |                |                         |                          |

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|----|--|---------------------------------|---------------------|----|--|--|--|--|
| 16 |  | Taking timings of MIMD programs | Chalk and Talk, PPT | 16 |  |  |  |  |
| 17 |  | GPU performance.                | Chalk and Talk, PPT | 17 |  |  |  |  |

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| <b>MODULE-3</b>                                 |                           |                                         |                     |                                 |                                 |                |                         |                          |
| 18                                              |                           | Distributed memory programming with MPI | Chalk and Talk, PPT | 18                              |                                 |                |                         |                          |
| 19                                              |                           | MPI functions                           | Chalk and Talk, PPT | 19                              |                                 |                |                         |                          |
| 20                                              |                           | The trapezoidal rule in MPI,            | Chalk and Talk, PPT | 20                              |                                 |                |                         |                          |
| 21                                              |                           | Dealing with I/O,                       | Chalk and Talk, PPT | 21                              |                                 |                |                         |                          |

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|----|--|----------------------------------------|---------------------|----|--|--|--|--|
| 22 |  | Collective communication               | Chalk and Talk, PPT | 22 |  |  |  |  |
| 23 |  | MPI-derived datatypes,                 | Chalk and Talk, PPT | 23 |  |  |  |  |
| 24 |  | Performance evaluation of MPI programs | Chalk and Talk, PPT | 24 |  |  |  |  |
| 25 |  | A parallel sorting algorithm.          | Chalk and Talk, PPT | 25 |  |  |  |  |

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| <b>MODULE-4</b>                                        |                           |                                       |                     |                                        |                                 |                |                                    |                          |
| 26                                                     |                           | Shared-memory programming with OpenMP | Chalk and Talk, PPT | 26                                     |                                 |                |                                    |                          |
| 27                                                     |                           | openmp pragmas and directives,        | Chalk and Talk, PPT | 27                                     |                                 |                |                                    |                          |

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|----|--|---------------------------------------------|---------------------|----|--|--|--|--|
| 28 |  | The trapezoidal rule,                       | Chalk and Talk, PPT | 28 |  |  |  |  |
| 29 |  | Scope of variables, The reduction clause,   | Chalk and Talk, PPT | 29 |  |  |  |  |
| 30 |  | loop carried dependency, scheduling,        | Chalk and Talk, PPT | 30 |  |  |  |  |
| 31 |  | producers and consumers, Caches,            | Chalk and Talk, PPT | 31 |  |  |  |  |
| 32 |  | cache coherence and false sharing in openmp | Chalk and Talk, PPT | 32 |  |  |  |  |
| 33 |  | tasking, thread safety.                     | Chalk and Talk, PPT | 33 |  |  |  |  |

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| <b>MODULE-5</b>                                        |                           |                      |             |                                        |                                 |                |                                    |                          |

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|----|--|----------------------------------------------------------------------------------|---------------------|----|--|--|--|--|
| 34 |  | GPU programming with CUDA - GPUs and GPGPU                                       | Chalk and Talk, PPT | 34 |  |  |  |  |
| 35 |  | GPU architectures, Heterogeneous computing,                                      | Chalk and Talk, PPT | 35 |  |  |  |  |
| 36 |  | Threads, blocks, and grids Nvidia compute capabilities and device architectures, | Chalk and Talk, PPT | 36 |  |  |  |  |
| 37 |  | Vector addition, Returning results from CUDA kernels,                            | Chalk and Talk, PPT | 37 |  |  |  |  |
| 38 |  | CUDA trapezoidal rule I,                                                         | Chalk and Talk, PPT | 38 |  |  |  |  |
| 39 |  | CUDA trapezoidal rule II: improving performance,                                 | Chalk and Talk, PPT | 39 |  |  |  |  |
| 40 |  | CUDA trapezoidal rule III: blocks with more than one warp.                       | Chalk and Talk, PPT | 40 |  |  |  |  |

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|                    | Activity                                         | Planned | Actual             | Remarks |
|--------------------|--------------------------------------------------|---------|--------------------|---------|
| 1                  | Theory Classes                                   | 40      |                    |         |
| 2                  | Assignments/ Quizzes/<br>Self-study              | 3       |                    |         |
| 3                  | Tutorials/ Extra classes                         | -       |                    |         |
| 4                  | Internal Assessments                             | 3       |                    |         |
| 5                  | ICT based Teaching<br>(% of usage in Curriculum) | 100%    |                    |         |
| Planning           |                                                  |         | Execution          |         |
| Faculty Signature: |                                                  |         | Faculty Signature: |         |
| HoD Signature:     |                                                  |         | HoD Signature:     |         |