Nagar Yuwak Shikshan Sanstha’s 

Yeshwantrao Chavan College of Engineering 

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University) Hingna Road, Wanadongri, Nagpur - 441 110

NAAC A++

Ph.: 07104-237919, 234623, 329249, 329250 Fax: 07104-232376, Website: www.ycce.edu Department of Artificial Intelligence & Data Science

**Vision of the Department**

*To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.* **Mission of the Department**

*To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem solving skills through emerging technologies****.***

**Session 2025-2026**

| **Vision:** Dream of where you want. | **Mission:** Means to achieve Vision |
| --- | --- |

**Program Educational Objectives of the program (PEO):** (broad statements that describe the professional and career accomplishments)

| PEO1 | **Preparation** | **P: Preparation** | **Pep-CL abbreviation**  **pronounce as Pep-si-lL easy to recall** |
| --- | --- | --- | --- |
| PEO2 | **Core Competence** | **E: Environment**  **(Learning Environment)** |
| PEO3 | **Breadth** | **P: Professionalism** |
| PEO4 | **Professionalism** | **C: Core Competence** |
| PEO5 | **Learning**  **Environment** | **L: Breadth (Learning in diverse areas)** |

**Program Outcomes (PO):** (statements that describe what a student should be able to do and know by the end of a program)

**Keywords of POs:**

Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

**PSO Keywords:** Cutting edge technologies, Research

“I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life.” *to contribute to the development of cutting-edge technologies and Research*.

**Integrity:** I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

**Name and Signature of Student and Date**

Mohika Jugele - 28/10/25

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| **Session** | 2025-26 (ODD) | **Course Name** | HPC Lab |
| --- | --- | --- | --- |
| **Semester** | 7 AIDS | **Course Code** | 22ADS706 |
| **Roll No** | 03 | **Name of Student** | Debasrita Chattopadhyay |

| Practical Number | **08** |
| --- | --- |
| Course Outcome | **1. Understand and Apply Parallel Programming Concepts 2. Analyze and Improve Program Performance.**  **3. Demonstrate Practical Skills in HPC Tools and Environments.** |
| Aim | **Introduction to GPU Programming (CUDA on CentOS)** |
| Problem Definition | This guide provides a simple step-by-step introduction to GPU programming using CUDA on CentOS. |
| Theory  (100 words) | CUDA (Compute Unified Device Architecture) is a GPU programming environment that facilitates general-purpose computing on GPU hardware, leveraging large parallel processing power. CUDA was developed by NVIDIA as a parallel computing platform and programming model, which allows programmers to write programs in C, C++, or Fortran, and then run on the GPU as a computing engine. In a CUDA-based system, the CPU (host) is responsible for program coordination, while the GPU (device) performs complicated data-parallel computations and thousands of lightweight parallel threads. For example, if implemented on CentOS environment CUDA programming would require an NVIDIA driver, the CUDA toolkit and a compiler which is compatible with CUDA. Programs are written using certain keywords \_\_global\_\_, \_\_device\_\_ and \_\_host\_\_ to define the GPU kernels (the functions executing on the GPU). |
| Procedure and  Execution  (100 Words) | Steps of Implementation:-  • **Install NVIDIA Driver and CUDA Toolkit** on CentOS. • **Verify CUDA installation** using nvcc --version command.  • **Write CUDA program** in C/C++ using .cu extension. • **Define kernel function** with \_\_global\_\_ keyword for GPU execution.  • **Allocate memory** on host (CPU) and device (GPU). • **Transfer data** from host to device using cudaMemcpy(). • **Launch kernel** with specified grid and block dimensions. • **Copy results** back from device to host memory. • **Free allocated GPU memory** using cudaFree(). • **Compile and run program** using nvcc filename.cu -o output && ./output. |

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|  | Code: |
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|  | Output: |
| --- | --- |
| Output Analysis | This output shows the sum value of corresponding elements from two vectors. Each thread performs one addition, while the GPU executes these additions in parallel. The final result demonstrates both the successful transfer of data to the GPU as well as the successful execution of a kernel on the GPU. |
| Link of student Github profile where lab  assignment has been uploaded | https://github.com/Mohikaaa18/HPC-Lab |
| Conclusion | The program demonstrates parallel computation using CUDA for efficient vector addition. |
| Plag Report  (Similarity index < 12%) |  |
| Date | **28/10/2025** |