



Department of Computer Technology

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-IL 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

(Signature and Date in Handwritten)



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

| | |
|---|---|
| Practical Number | 01 |
| Course Outcome | 1. Understand and Apply Parallel Programming Concepts 2. Analyse and Improve Program Performance. 3. Demonstrate Practical Skills in HPC Tools and Environments. |
| Aim | Introduction to Linux and HPC Environment |
| Problem Definition | Implement basic Linux commands and understand HPC Environment |
| Theory (100 words) | <p>Linux is an operating system based on the Unix operating system and open-source. Its open-source features, stability, flexibility, and security have made it a popular choice for research and server environments. Linux gives you the ability to support multiple users, and multitasking, and does so reliably, which can be advantageous in a high-stress environment.</p> <p>High-Performance Computing, or HPC, refers to the function of supercomputers and computing clusters to solve problems requiring substantial computing capabilities. Instead of using a single, capable processor, HPC takes as many as thousands of processors in parallel to complete large-scale simulations, surveys and scientific research tasks such as weather prediction, molecular modelling, and machine learning.</p> |
| Procedure and Execution (100 Words) | <p>Step 1: Understand Linux Basics pwd → show current directory ls → list files cd → change directory cp, mv, rm → copy, move, delete files chmod, chown → change permissions/ownership top, htop → monitor running processes</p> <p>Step 2: Explore the Linux File System Step 3: Work with the Shell Use shell interpreters (e.g., bash, zsh) for command execution.</p> |



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Step 3: Linux in HPC Environment

5.1. Use Linux as the primary OS in HPC clusters due to efficiency and flexibility.

Step 4: Resource Management

6.1. Learn about job scheduling systems (e.g., SLURM, PBS, LSF).

Commands

```
cd HPC
touch first.sh
ls
mkdir YCCE
ls
expr 5+3
touch prog.txt
touch first.txt
cat first.txt
cp first.txt second.txt
cat second.txt
ps
lscpu
sort first.txt
cal August 2025
```

Output:

```
lab1@localhost ~]$ pwd
/home/lab1
lab1@localhost ~]$ mkdir
mkdir: missing operand
Try 'mkdir --help' for more information.
lab1@localhost ~]$ mkdir HPC
lab1@localhost ~]$ ls
.          khushipractical.c  ospr3.c    paru7.c    pr9.c       Public
..         mayur           ospr4.c    paru.c     prac2       s44
3.c        mayur.c          ospr5.c    parut.c    prac2.c    sample
4.c        mspa            ospr8.c    p.c        prac6.c    sample.c
5.c        mspa2_50.c       p4.c       Pictures    prac9.c    samplec
6.c        mspa2.c         p6.c       ppp6.c     practical3.c shell.c
7.c        mspa3_50.c      page.c     pppp3.c    practical6.c simple
8.c        mspa4.c         pagerep1.c pr3         practical.c sospr8.c
9.c        mspa.c         pagerep.c  pr3.c     practicalr3.c Templates
about      Music              par_2.c    pr4.c     practice5   test.c
bin         prsha.c             parc2.c    pr5.c     practice.c  vedanti.c
boot       os3.c               parth.c    pr7.c     pratical9.c vedanti.c
dev         os5.c
```

```
[lab1@localhost ~]$ cd HPC
[lab1@localhost HPC]$ touch first.sh
[lab1@localhost HPC]$ ls
first.sh
[lab1@localhost HPC]$ mkdir YCCE
[lab1@localhost HPC]$ ls
first.sh  YCCE
[lab1@localhost HPC]$ expr 5 + 3
8
[lab1@localhost HPC]$ touch prog.txt
[lab1@localhost HPC]$ touch first.txt
[lab1@localhost HPC]$ cat first.txt
Welcome to HPC lab !
This is Debasrita Chattopadhyay.
[lab1@localhost HPC]$ cp first.txt second.txt
[lab1@localhost HPC]$ cat second.txt
Welcome to HPC lab !
This is Debasrita Chattopadhyay.
[lab1@localhost HPC]$ mv prog.txt renamed.txt
```



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lab1@localhost:~/HPC

ar/lib/pcp/testsuite/views/GNUMakefile
ar/lib/sss/deskprofile
abl@localhost HPC]\$ ps
PID TTY TIME CMD
7304 pts/0 00:00:00 bash
14138 pts/0 00:00:00 ps
abl@localhost HPC]\$ top

p - 11:15:45 up 1:01, 2 users, load average: 0.22, 0.40, 0.33
sks: 429 total, 1 running, 428 sleeping, 0 stopped, 0 zombie
pu(s): 1.0 us, 0.2 sy, 0.0 ni, 98.7 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
B Mem : 15105.7 total, 11089.9 free, 2619.9 used, 1771.9 buff/cache
B Swap: 3814.0 total, 3814.0 free, 0.0 used, 12485.8 avail Mem

| PID | USER | PR | NI | VIRT | RES | SHR | S | %CPU | %MEM | TIME+ | COMMAND |
|-------|------|----|----|---------|--------|--------|---|------|------|---------|----------|
| 7955 | lab1 | 20 | 0 | 11.5g | 542496 | 250540 | S | 7.6 | 3.5 | 2:05.79 | firefox |
| 9349 | lab1 | 20 | 0 | 2901964 | 250100 | 116824 | S | 6.6 | 1.6 | 0:14.88 | Isolate+ |
| 4700 | lab1 | 20 | 0 | 6499964 | 271956 | 144280 | S | 2.7 | 1.8 | 0:39.39 | gnome-s+ |
| 8470 | lab1 | 20 | 0 | 2882624 | 243028 | 126892 | S | 0.7 | 1.6 | 0:41.51 | Isolate+ |
| 7286 | lab1 | 20 | 0 | 766264 | 52900 | 40184 | S | 0.3 | 0.3 | 0:05.06 | gnome-t+ |
| 11555 | root | 20 | 0 | 0 | 0 | 0 | D | 0.3 | 0.0 | 0:00.47 | kworker+ |
| 1 | root | 20 | 0 | 175796 | 17844 | 10776 | S | 0.0 | 0.1 | 0:02.03 | systemd |
| 2 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.01 | kthreadd |
| 3 | root | 20 | 0 | 0 | 0 | 0 | S | 0.0 | 0.0 | 0:00.00 | pool_wo+ |

lab1@localhost:~/HPC

[lab1@localhost HPC]\$ wc -w first.txt
9 first.txt
[lab1@localhost HPC]\$ lscpu
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 48 bits physical, 48 bits virtual
Byte Order: Little Endian
CPU(s): 16
On-line CPU(s) list: 0-15
Vendor ID: AuthenticAMD
Model name: AMD Ryzen 7 4700G with Radeon Graphics
CPU family: 23
Model: 96
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 1
Stepping: 1
Frequency boost: enabled
CPU(s) scaling MHz: 97%
CPU max MHz: 3600.0000
CPU min MHz: 1400.0000
BogoMIPS: 7186.87
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge m
ca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall

lab1@localhost:~/HPC

Virtualization features:
Virtualization: AMD-V
Caches (sum of all):
L1d: 256 KiB (8 instances)
L1i: 256 KiB (8 instances)
L2: 4 MiB (8 instances)
L3: 8 MiB (2 instances)
NUMA:
NUMA node(s): 1
NUMA node0 CPU(s): 0-15
Vulnerabilities:
Gather data sampling: Not affected
Itlb multihit: Not affected
L1tf: Not affected
Mds: Not affected
Meltdown: Not affected
Mmio stale data: Not affected
Reg file data sampling: Not affected
Retbleed: Mitigation; untrained return thunk; SMT enabled with S
TIBP protection
Spec rstack overflow: Mitigation; Safe RET
Spec store bypass: Mitigation; Speculative Store Bypass disabled via prct
l
Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointe



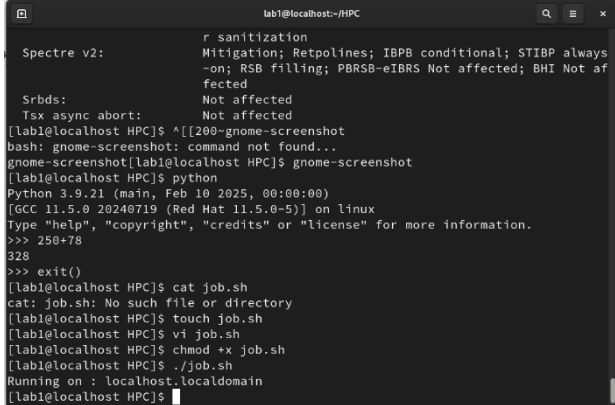
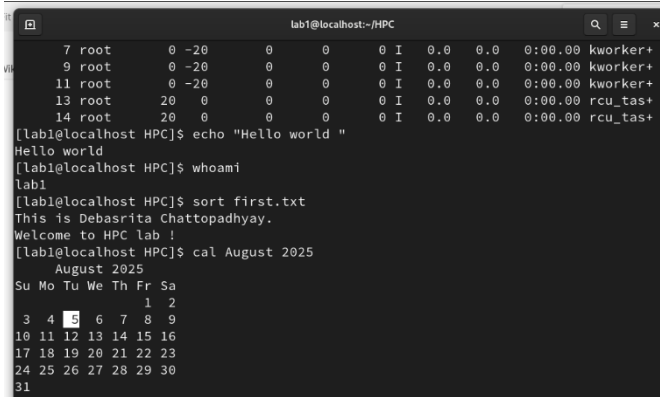
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| Output Analysis | Output Analysis in Linux/HPC involves checking correctness, performance, scalability, and errors using system commands, scheduler logs, and profiling/debugging tools. |
| Link of student Github profile where lab assignment has been uploaded | https://github.com/srita2003/HPC_Practicals/blob/main/03_Practical%20No_01_HPC.pdf |
| Conclusion | Introduction to Linux and HPC Environment implemented successfully. |



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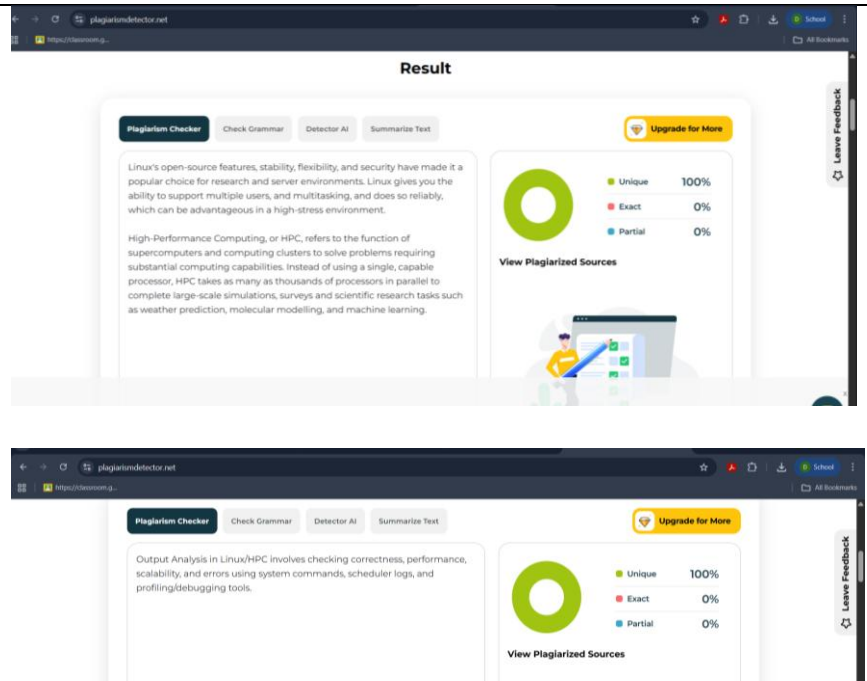
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