

**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: To harness the power of artificial intelligence and data science to solve real-world problems and enhance human potential.	Mission: To acquire skills through coursework, projects, and internships, while actively engaging in research and collaboration with peers to innovate and apply AI solutions.
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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.

Prerana Bijekar 28 August 2025

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	11	Name of Student	Prerana Bijekar

Practical Number	1
Course Outcome	CO1: Understand and Apply Parallel Programming Concepts CO2: Analyze and Improve Program Performance. CO3: Demonstrate Practical Skills in HPC Tools and Environments.
Aim	Introduction to Linux and HPC Environment
Theory (100 words)	<ol style="list-style-type: none">Linux Basics:<ul style="list-style-type: none">Open-source, UNIX-based operating system.Multi-user, multi-tasking with strong security.Organized file system (/ root).Mostly used via command line.Package managers: apt, yum, etc.HPC Environment:<ul style="list-style-type: none">High-Performance Computing = solving large problems using clusters/supercomputers.Cluster has head node (job submission), compute nodes (processing), storage nodes (data).Uses parallel computing (MPI, OpenMP).Job schedulers (SLURM, PBS) manage resources.Shared file systems (NFS, Lustre).Widely used in science, AI, weather, bioinformatics.Almost all HPC systems run on Linux.



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Procedure and Execution (100 Words)	Algorithm: 1. Linux Commands: <ul style="list-style-type: none">• ls: to see saved files• pwd: present directory• mkdir: create new directory• cd: change directory• touch filename.extension: creating new file• mkdir foldername: creating new directory• vi filename.extension: open file in editor• rm filename.extension: delete file• rmdir foldername: delete directory 2. HPC Commands: <ul style="list-style-type: none">• top: shows running files• esc+exit: exits from top• q: return to write commands• lscpu: CPU details
	Code: <ul style="list-style-type: none">• Creating directory: mkdir HPC• Creating files: touch file1.txt• Copying content of one file to another: cp file1.txt file2.txt• Listing directories: ls• Deleting file: rm first.sh



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Output:

```
Activities Terminal
[lab1@localhost ~]$ cd HPC
[lab1@localhost HPC]$ touch file1.txt
[lab1@localhost HPC]$ touch file2.txt
[lab1@localhost HPC]$ ls
file1.txt  file2.txt  first_prog.txt  first.sh  YCCE
[lab1@localhost HPC]$ vi file1.txt
[lab1@localhost HPC]$ vi file1.txt
[lab1@localhost HPC]$ cp file1.txt file2.txt
[lab1@localhost HPC]$ vi file2.txt
[lab1@localhost HPC]$ rm first.sh
[lab1@localhost HPC]$ ls
file1.txt  file2.txt  first_prog.txt  YCCE
[lab1@localhost HPC]$ top
```

```
Activities Terminal Aug 5 11:50
lab1@localhost:~/HPC
[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:               7186.90
Flags:                  fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp
                        lm constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmperf rapl pni pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe
                        e_popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoex
                        xt perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 hw_pstate ssbd mba ibrs ibpb stibp vmcall fsgsbase bmi1 avx2 smep bmi2
                        cqm rdt_a rdseed adx smop clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_llc cqm_mba_total cqm_mba_local clzero irperf xsave
                        erptr rdpru wbinvd cpcic arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_vmsav
                        e_vmload vgif v_spec_ctrl umip rdpid overflow_recov succor smca
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
  Mds:                  Not affected
```

```
Activities Terminal Aug 5 11:51
lab1@localhost:~/HPC
Type "help", "copyright", "credits" or "license" for more information.
>>> module
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'module' is not defined
>>> a = 10
>>> b = 2
>>> c = a + b
>>> print(c)
12
>>> print(a+b)
20
>>> print(a/b)
5.0
>>> print(a-b)
8
>>> print(a*b)
0
>>> print(a*b)
100
>>> print(a/b)
5
>>>
KeyboardInterrupt
>>> !wc
  File "<stdin>", line 1
    !wc
    ^
SyntaxError: invalid syntax
>>> help
Type help() for interactive help, or help(object) for help about object.
>>> exit
Use exit() or Ctrl-D (i.e. EOF) to exit
>>>
[lab1@localhost HPC]$ cat second.sh
cat: second.sh: No such file or directory
[lab1@localhost HPC]$ cat second.sh
[lab1@localhost HPC]$ touch second.sh
[lab1@localhost HPC]$ cat second.sh
[lab1@localhost HPC]$ vi second.sh
[lab1@localhost HPC]$
```



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Output Analysis	The Linux and HPC environment together provide a stable, secure, and scalable platform for running computationally intensive tasks. Linux ensures efficient system management, while HPC clusters enable parallel execution and resource sharing, leading to faster problem-solving in research and industry.
Conclusion	Linux serves as the backbone of HPC environments due to its flexibility, reliability, and open-source nature. Combined with powerful cluster architectures, it enables efficient handling of large-scale computations, making it essential for modern scientific research and advanced data-driven applications.
Plag Report (Similarity index < 12%)	
Date	28 August 2025