Programme Name/s	**: Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Data Sciences/ Computer Hardware & Maintenance/ Information Technology/ Computer Science & Information Technology**
Programme Code	**: AI/ AN/ BD/ CM/ CO/ CW/ DS/ HA/ IF/ IH**
Semester	**: Second**
Course Title	**: LINUX BASICS**
Course Code	**: 312001**

I. RATIONALE

Linux Operating System is Open source and freely distributed Operating System (O.S). Apart from the fact that it's freely distributed, Linux's functionality, adaptability, and robustness make it highly suitable for the server platform. The course aims to provide knowledge in the basics of Linux, shell, and command line essentials.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry-identified outcomes through various teaching-learning experiences:
1) To understand the basics of Linux operating system fundamentals and its open-source nature.
2) Basic Scripting Skills for automating tasks and creating custom shell scripts.
3) Ability to perform file operations and manipulate directories.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Install Linux operating system.
- CO2 - Execute general purpose commands of the Linux operating system.
- CO3 - Manage files and directories in Linux operating system.
- CO4 - Use vi editor in Linux operating system.
- CO5 - Write programs using shell script.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		
																	Practical				
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312001	LINUX BASICS	BLP	DSC	2	-	2	-	4	2	-	-	-	-	-	25	10	25@	10	-	-	50

Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Describe the History of Linux. TLO 1.2 Identify different types of shells. TLO 1.3 Compare Linux file systems.	**Unit - I Introduction to Linux Operating System** 1.1 Introduction to Operating System and Linux. 1.2 History, Overview of Linux 1.3 Shell: Bourne, Korn, Cshell. 1.4 Linux releases, Linux File Systems (ext) and versions.	Chalk-Board Presentations
2	TLO 2.1 Execute General purpose commands. TLO 2.2 Use of mailx command. TLO 2.3 Display and change your terminal settings.	**Unit - II General Purpose Utilities** 2.1 cal: The calendar, date: Displaying the system date, echo: Displaying message, printf: An alternative to echo, bc: The calculator, script: Recording your session 2.2 Email basics, mailx: The universal mailer 2.3 passwd: Changing your password, who: Who are the users?, uname: Knowing your machine charactristics 2.4 tty: Knowing your terminal, stty: Displayig and setting terminal charactristics	Demonstration Presentations

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Explain the file types. TLO 3.2 Use absolute and relative pathnames. TLO 3.3 Execute file and Directory commands. TLO 3.4 Compress and archive files. TLO 3.5 Execute basic file attributes. TLO 3.6 Change file and directory permissions.	**Unit - III File Management in Linux** 3.1 The file: Ordinary file, Directory file, Device file, File name, The parent-child relationship, UNIX file system tree, The Unix file system, The home directory 3.1.1 pwd: Checking your current directory, cd: Changing the current directory, mkdir: Making directories, rmdir: Removing directories, ls: Listing directory contents 3.2 Absolute pathnames, Relative pathnames 3.3 Handling ordinary files, cat: Displaying and creating files, cp: Copying file, rm: Deleting files, mv: Renaming files, more: Paging output 3.4 The lp subsystem: printing a file, file: knowing the file types 3.5 wc: Counting lines, words and characters, od: Displaying data in octal, cmp: Comparing two files, comm: What is common?, diff: Converting one file to other 3.6 gzip and gunzip: Compressing and decompressing files, tar: The archival program, zip and unzip: Compressing and archiving together 3.7 Basic file attributes, ls -l: Listing file attributes, the -d option: Listing directory attributes 3.8 File ownership, File permissions, chmod: Changing file permissions, directory permission, Changing file ownership, chown: Changing file owner, chgrp: Changing group owner	Demonstration Presentations
4	TLO 4.1 Create and modify files using the vi editor. TLO 4.2 Use the line editing command. TLO 4.3 Use the navigation command in vi editor. TLO 4.4 Search a pattern in vi editor. TLO 4.5 Explain the Shell's Interpretive Cycle. TLO 4.6 Use of pattern matching and wildcards. TLO 4.7 Use of Shell variables.	**Unit - IV The vi Editor and Shell** 4.1 The vi Editor: vi Command, Input, and Line Editing Modes. 4.2 Creating, Saving and Quitting a File in vi, Managing Editing Modes in vi. 4.3 vi Editing Commands: Common Operations. 4.4 Navigation: Movement in the four direction (h, j, k and l), Word navigation (b, e and w), Moving to Line extremes (0, | and $), Scrolling ([Ctrl-f], [Ctrl-b], [Ctrl-d] and [Ctrl-u], Absolute Movement (G) 4.5 Searching for a pattern(/ and ?), Repeating the last pattern search (n and N) 4.6 The Shell: The Shell's interpretive cycle, Shell offerings, Pattern matching: The wild-cards, Escaping and quoting, Redirection: The three standard files, /dev/null and /dev/tty: Two special files 4.7 Pipes, tee: Creating a tee, Common substitution, Shell Variables	Demonstration Presentations

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Execute Linux filters. TLO 5.2 Execute commands using regular expressions. TLO 5.3 Execute shell script programs.	**Unit - V Filters, Regular Expressions and Shell Programming** 5.1 Simple Filters: The sample database, pr: Paginating files, head: Displaying the beginning of a file, tail: Displaying the end of a file, cut: Splitting a file vertically, paste: Pasting files, sort: Ordering file, uniq: Locate repeated and nonrepeated lines, tr: Translating characters 5.2 Filters using regular expressions, grep: Searching for a pattern, Basic regular expression (BRE)- An introduction, Extended regular expressions (ERE) and egrep, sed: The stream editor 5.3 Essential Shell programming, Shell scripts, read: Making scripts interactive, Using command line arguments, exit and Exit status of command, The logical operators && and ||- Conditional executions 5.4 The if conditional, Using test and [ ] to evaluate expressions, the case conditional, expr: Computation and string handling, $0: Calling a script by different names 5.5 while: Looping, for: Looping with a list	Demonstration Presentations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 * Install and configure the Linux operating system.	1	Install the Linux Operating System.	4	CO1
LLO 2.1 * Execute the following general-purpose Linux commands. 1) cal 2) date 3) echo 4) printf 5) bc 6) script 7) mailx 8) man 9) clear	2	Execute general purpose Linux commands.	2	CO2
LLO 3.1 * Execute the following general-purpose Linux commands. 1) passwd 2) who 3) whoami 4) uname 5) tty 6) stty 7) ps 8) kill 9) sleep	3	Execute general-purpose Linux commands.	2	CO2
LLO 4.1 * Execute the following file and Directory manipulation commands along with different options. 1) pwd 2) cd 3) mkdir 4) rmdir 5) ls 6) cat 7) rm 8) mv 9) cp	4	Execute file and Directory manipulation commands.	2	CO3
LLO 5.1 * Execute the following file and Directory manipulation commands along with different options. 1) touch 2) more 3) lp 4) file 5) wc 6) cmp 7) comm 8) diff 9) split	5	Execute file and Directory manipulation commands.	2	CO3
LLO 6.1 * Execute the following Linux commands for compressing decompressing and archiving files.1) gzip 2) gunzip 3) tar 4) tar -c 5) tar -x 6) zip 7) unzip	6	Execute Linux commands for compressing, decompressing, and archiving files.	2	CO3

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 7.1 * Execute the following commands to change file and directory permissions. 1) ls -l, ls -ld 2) chmod (with all options) 3) chown 4) chgrp	7	Change file and directory permissions.	2	CO3
LLO 8.1 * Use vi editor and execute all editor commands.	8	Use the vi editor to create and edit files.	2	CO4
LLO 9.1 Use wildcard characters (e.g., *, ?, []) to list and manipulate specific sets of files within the directory.	9	Use wildcard characters.	2	CO4
LLO 10.1 a) Create a text file with various lines of text. b) Create a complex pipeline by chaining multiple commands together using pipes (|).	10	Use of Pipes in Linux.	2	CO4
LLO 11.1 *Create input and output redirection in Linux.	11	Execute input and output redirection in Linux.	2	CO4
LLO 12.1 * Execute the following filters commands in Linux. 1) pr 2) head 3) tail 4) cut 5) paste 6) sort 7) uniq 8) tr	12	Execute the filters commands in Linux.	2	CO5
LLO 13.1 * Execute commands grep, egrep and sed in Linux.	13	Execute filters commands in Linux.	2	CO5
LLO 14.1 Read user input, exit and exit status commands, expr, and logical operators in shell scripts.	14	Execute shell scripts.	2	CO5
LLO 15.1 * Write the Shell script by using the "if" statement.	15	Execute the Shell script by using the if statement.	2	CO5
LLO 16.1 Write a Shell script by using the "while" loop.	16	Execute a Shell script by using the while loop.	2	CO5
LLO 17.1 Write a Shell script by using the "for"-loop.	17	Execute a Shell script by using the for loop.	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Not Applicable

Assignment

- Not Applicable

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system with all necessary components like; motherboard, random access memory (RAM), read-only memory (ROM), internal hard disk drives, Mouse, Keyboard, and open-source operating System. (RedHat, Ubuntu etc.).	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Linux Operating System	CO1	4	0	0	0	0
2	II	General Purpose Utilities	CO2	6	0	0	0	0
3	III	File Management in Linux	CO3	7	0	0	0	0
4	IV	The vi Editor and Shell	CO4	7	0	0	0	0
5	V	Filters, Regular Expressions and Shell Programming	CO5	6	0	0	0	0
		Grand Total		**30**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

• Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering
1) 60% weightage is to process
2) 40% weightage to product

Summative Assessment (Assessment of Learning)

• End Semester Examination, Lab Performance, Viva-voce.

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	2	3	1	-	3			
CO2	3	-	1	3	1	-	3			
CO3	3	-	1	3	1	-	3			
CO4	3	2	2	3	1	-	3			
CO5	3	2	2	3	1	-	3			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Richard Petersen	Linux The Complete Reference	McGraw Hill, 6th edition ISBN Number 978-0071492478
2	Richard Blum	Linux command line and shell scripting	Wiley India ISBN Number 978-1118983843
3	Prof. Dayanand Ambawade	Linux Lab: Hands on Linux	Dreamtech Press ISBN Number 9789350040003
4	Sumitabha Das	Unix Concepts and Applications	McGraw-Hill Education (India) Pvt Limited, 2006 ISBN Number 978-0070635463

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://maker.pro/linux/tutorial/basic-linux-commands-for-beginners	Linux Basic Commands
2	https://www.guru99.com/must-know-linux-commands.html	Linux Basic Commands
3	https://www.shellscript.sh/	Shell Scripts and Programs
4	https://www.tutorialspoint.com/unix/shell_scripting.html	Shell Scripts and Programs examples
5	https://spoken-tutorial.org/tutorial	Online Course