



**National Textile University**  
**Department of Computer Science**

**Subject**  
**Operating System**  
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**Submitted by:**

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**Registration Number**  
**23-NTU-CS-1167**

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**Lab No.**  
**02**

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**Semester**  
**5th**

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# Operating Systems – COC 3071L

SE 5th A – Fall 2025

## Lab 2: Linux Basics and Introduction

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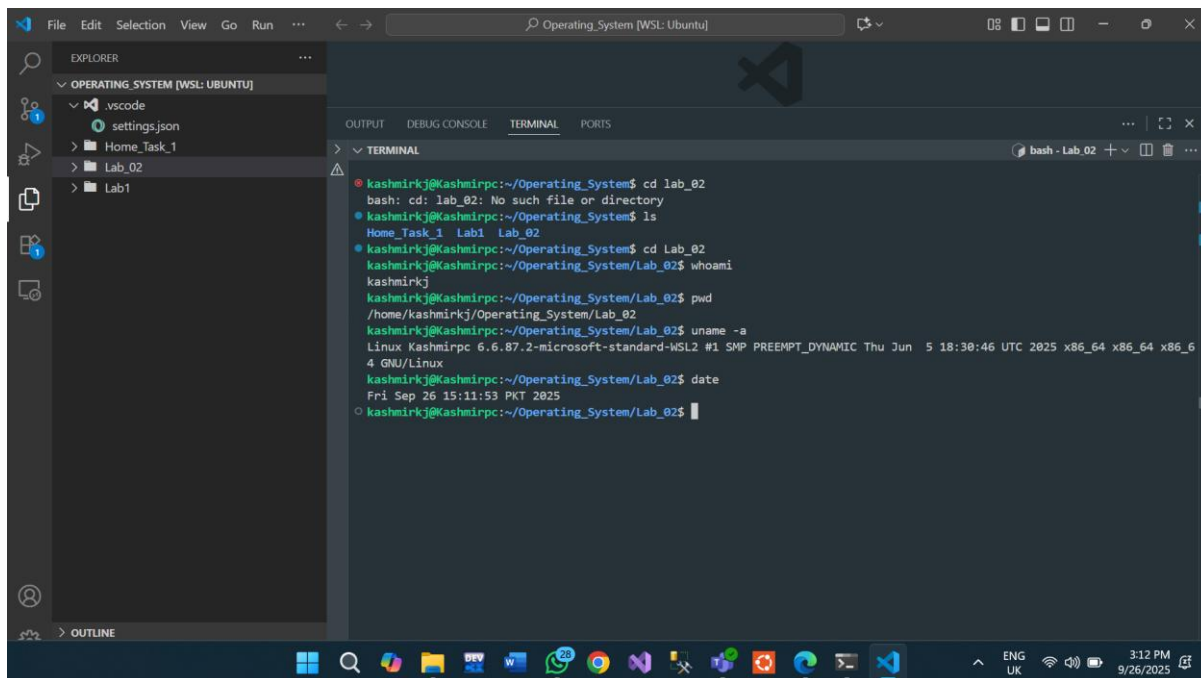
### Part 1: Linux Environment Orientation

#### 1.1 Understanding the Linux Environment

- **Concepts to Cover:**
  - What is Linux? Brief history and distributions
  - Linux vs Windows: Key differences
  - Understanding the shell (bash)
  - WSL2 as a Linux environment

- **Hands-on Activity:**

```
# Students open WSL2 terminal and explore
whoami          # Check current user
pwd             # Print working directory
uname -a        # System information
date           # Current date and time
```



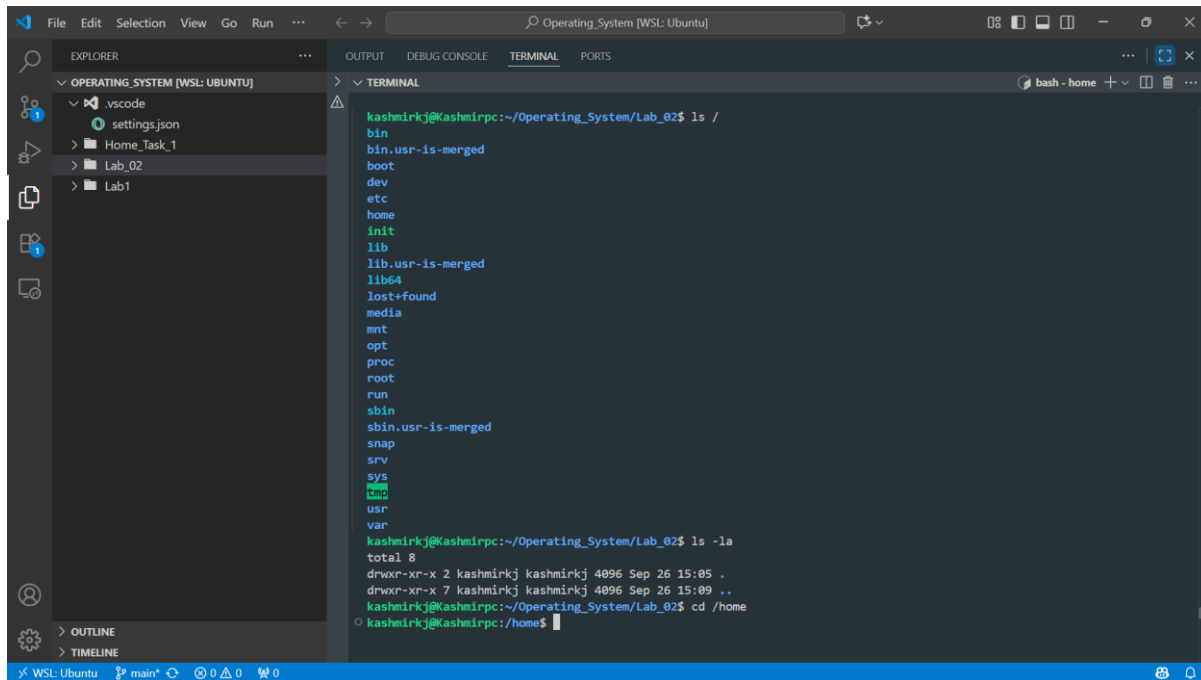
The screenshot shows a Windows Subsystem for Linux (WSL2) terminal window. The terminal is titled "Operating\_System [WSL: Ubuntu]". The left sidebar shows the Explorer view with the file structure: OPERATING\_SYSTEM [WSL: UBUNTU] > .vscode > settings.json > Home\_Task\_1 > Lab\_02 > Lab1. The terminal output shows the following commands and their results:

```
kashmirj@Kashmirpc:~/Operating_System$ cd lab_02
bash: cd: lab_02: No such file or directory
kashmirj@Kashmirpc:~/Operating_System$ ls
Home_Task_1  Lab1  Lab_02
kashmirj@Kashmirpc:~/Operating_System$ cd Lab_02
kashmirj@Kashmirpc:~/Operating_System/Lab_02$ whoami
kashmirj
kashmirj@Kashmirpc:~/Operating_System/Lab_02$ pwd
/home/kashmirj/Operating_System/Lab_02
kashmirj@Kashmirpc:~/Operating_System/Lab_02$ uname -a
Linux Kashmirpc 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT_DYNAMIC Thu Jun 5 18:30:46 UTC 2025 x86_64 x86_64 x86_64 GNU/Linux
kashmirj@Kashmirpc:~/Operating_System/Lab_02$ date
Fri Sep 26 15:11:53 PKT 2025
kashmirj@Kashmirpc:~/Operating_System/Lab_02$
```

## 1.2 Getting Help in Linux

- **Commands to demonstrate:**

<code>man ls</code>	# Manual pages
<code>ls --help</code>	# Built-in help
<code>which ls</code>	# Location of commands
<code>type ls</code>	# Command type information



The screenshot shows a VS Code editor window with a terminal pane open. The terminal is running a Linux environment (WSL: Ubuntu). The user has executed the command `ls /` in the terminal, which displays the root directory's contents. The output is as follows:

```
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls /
bin
bin.usr-is-merged
boot
dev
etc
home
init
lib
lib.usr-is-merged
lib64
lost+found
media
mnt
opt
proc
root
run
sbin
sbin.usr-is-merged
snap
srv
sys
tmp
usr
var

kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -la
total 8
drwxr-xr-x 2 kashmirkj kashmirkj 4096 Sep 26 15:05 .
drwxr-xr-x 7 kashmirkj kashmirkj 4096 Sep 26 15:09 ..
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ cd /home
kashmirkj@Kashmirpc:/home$
```

## Part 2: File System Navigation

### 2.1 Understanding Linux Directory Structure

- **Concepts to Cover:**
  - Root directory (/)
  - Important directories: /home, /usr, /etc, /var, /tmp
  - Absolute vs relative paths
  - Hidden files and directories
- **Demonstration:**

<code>ls /</code>	# Root directory contents
<code>ls -la</code>	# Long listing with hidden files
<code>cd /home</code>	# Change directory
<code>cd ~</code>	# Home directory shortcut
<code>cd -</code>	# Previous directory

```
File Edit Selection View Go Run ...  
Operating_System [WSL: Ubuntu]  
EXPLORER  
OPERATING_SYSTEM [WSL: UBUNTU]  
  .vscode  
  settings.json  
  Home_Task_1  
  Lab_02  
  Lab1  
TERMINAL  
bash - Lab_02  
boot  
dev  
etc  
home  
init  
lib  
lib usr-is-merged  
lib64  
lost+found  
media  
mnt  
opt  
proc  
root  
run  
sbin  
sbin usr-is-merged  
snap  
srv  
sys  
tmp  
usr  
var  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -la  
total 8  
drwxr-xr-x 2 kashmirkj kashmirkj 4096 Sep 26 15:05 .  
drwxr-xr-x 7 kashmirkj kashmirkj 4096 Sep 26 15:09 ..  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ cd /home  
kashmirkj@Kashmirpc:/home$ ~  
bash: /home/kashmirkj: Is a directory  
kashmirkj@Kashmirpc:/home$ cd -  
/home/kashmirkj/Operating_System/Lab_02  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$
```

## 2.2 Basic Navigation Commands (15 minutes)

- Commands to practice:

<code>pwd</code>	# Present working directory
<code>ls</code>	# List directory contents
<code>ls -l</code>	# Long format
<code>ls -la</code>	# Include hidden files
<code>ls -lh</code>	# Human readable sizes
<code>cd</code>	# Change directory
<code>cd ..</code>	# Parent directory
<code>cd ~</code>	# Home directory
<code>cd /</code>	# Root directory

```
File Edit Selection View Go Run ...  
Operating_System [WSL: Ubuntu]  
EXPLORER  
OPERATING_SYSTEM [WSL: UBUNTU]  
  .vscode  
  settings.json  
  Home_Task_1  
  Lab_02  
  Lab1  
TERMINAL  
bash - Lab_02  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ pwd  
/home/kashmirkj/Operating_System/Lab_02  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -l  
total 0  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -la  
total 8  
drwxr-xr-x 2 kashmirkj kashmirkj 4096 Sep 26 15:05 .  
drwxr-xr-x 7 kashmirkj kashmirkj 4096 Sep 26 15:09 ..  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -lh  
total 0  
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ cd  
kashmirkj@Kashmirpc:~$ cd ..  
kashmirkj@Kashmirpc:/home$ cd ~  
kashmirkj@Kashmirpc:~$ cd /  
kashmirkj@Kashmirpc:/ $ ls /  
bin boot etc init lib usr-is-merged lost+found mnt proc run sbin usr-is-merged srv tmp var  
bin usr-is-merged dev home lib lib64 media opt root sbin snap sys usr  
kashmirkj@Kashmirpc:/ $
```

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## Part 3: File and Directory Operations

### **\*\*3.1 Creating and Managing Files/Directories**

- **Commands to demonstrate:**

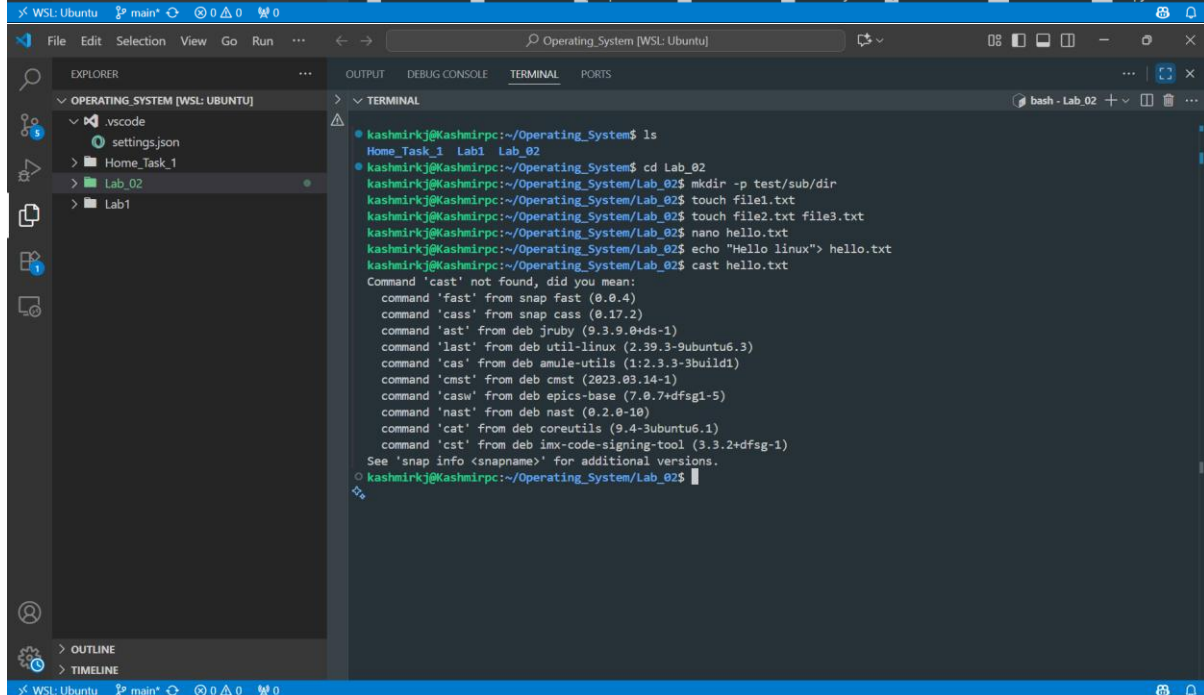
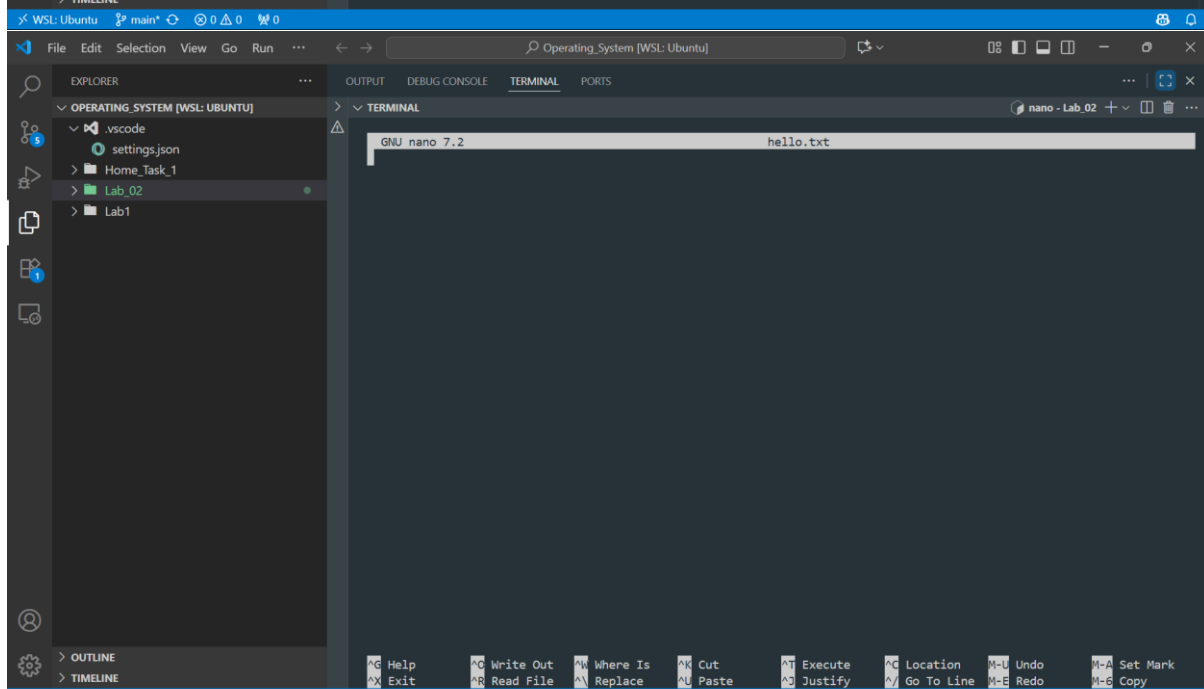
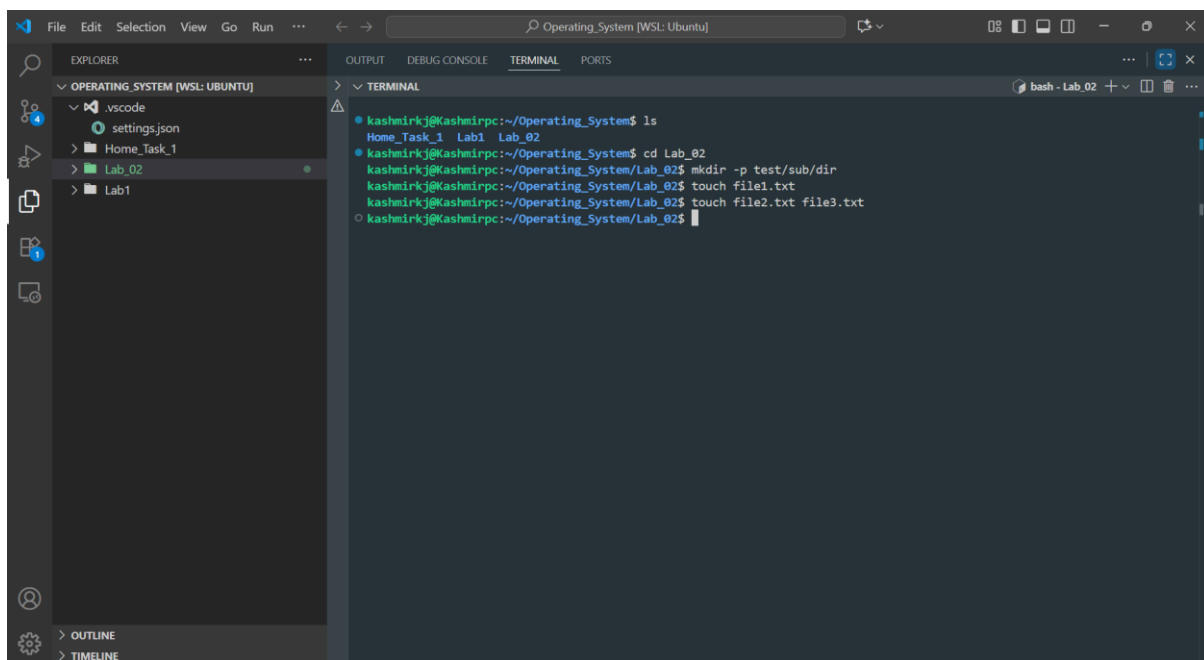
```
mkdir mylab2          # Create directory
mkdir -p test/sub/dir # Create nested directories
touch file1.txt       # Create empty file
touch file2.txt file3.txt # Multiple files

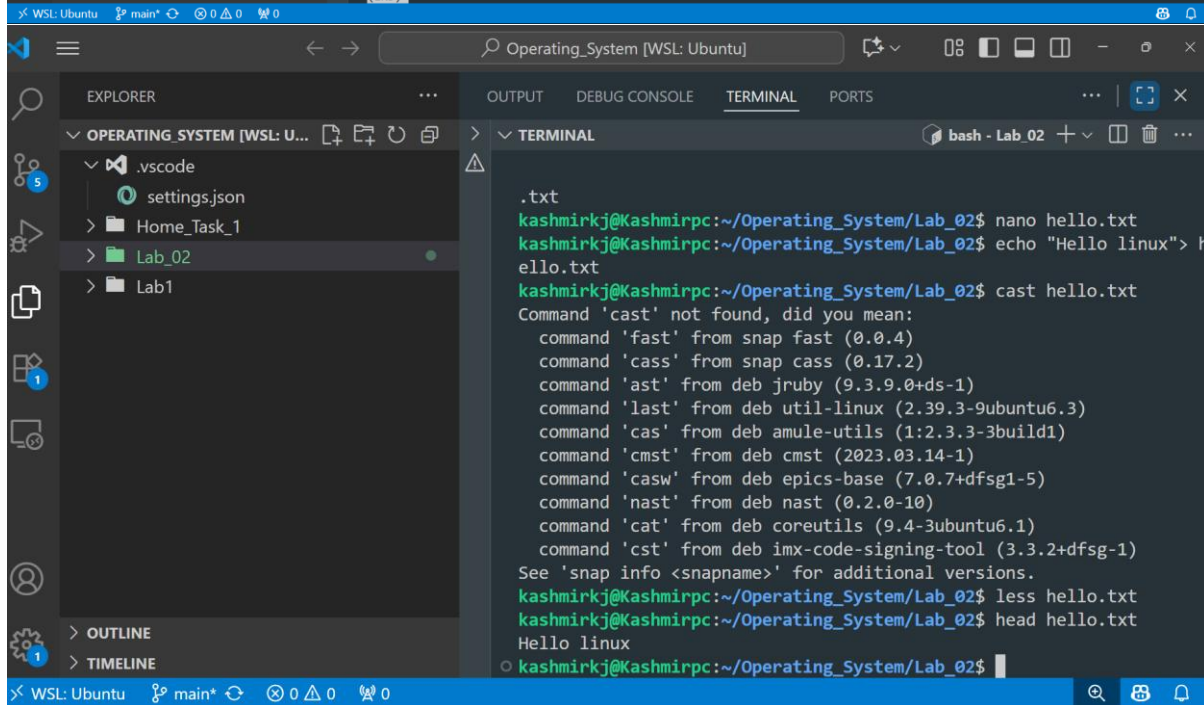
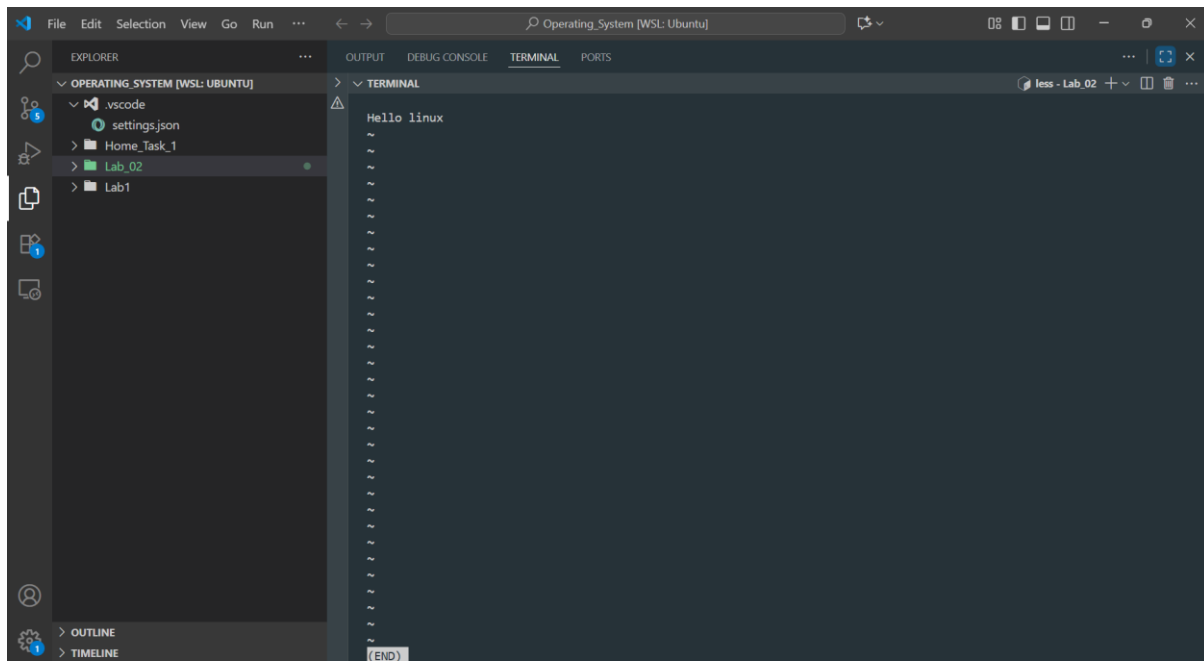
# Text editors introduction
nano hello.txt        # Simple text editor
# OR
echo "Hello Linux!" > hello.txt # Redirect output to file
```

- **File viewing commands:**

```
cat hello.txt          # Display file contents
less hello.txt         # Page through file
head hello.txt         # First 10 lines

tail hello.txt         # Last 10 lines
wc hello.txt           # Word count
```





This screenshot shows the Visual Studio Code interface with the Explorer view on the left, the Code editor in the center, and the Output view on the right. The Explorer view shows a project structure with folders like .vscode, Home\_Task\_1, Lab\_02, and Lab1. The Code editor shows a file named file1.txt. The Output view shows the terminal output of the command 'ls' in the directory ~/Operating\_System/Lab\_02. The terminal output lists the files: file1.txt, file2.txt, file3.txt, and hello.txt. The terminal also shows the command 'cd Lab\_02' and the command 'mkdir -p test/sub/dir'. The terminal output for 'ls' is as follows:

```
kashmirkj@Kashmirpc:~/Operating_System$ ls
Home_Task_1  Lab1  Lab_02
kashmirkj@Kashmirpc:~/Operating_System$ cd Lab_02
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ mkdir -p test/sub/dir
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ touch file1.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ touch file2.txt file3.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ nano hello.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ echo "Hello linux"> hello.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ cast hello.txt
Command 'cast' not found, did you mean:
  command 'fast' from snap fast (0.0.4)
  command 'cass' from snap cass (0.17.2)
  command 'ast' from deb jruby (9.3.9.0+ds-1)
  command 'last' from deb util-linux (2.39.3-9ubuntu6.3)
  command 'cas' from deb amule-utils (1:2.3.3-3build1)
  command 'cmst' from deb cmst (2023.03.14-1)
  command 'casw' from deb epics-base (7.0.7+dfsg1-5)
  command 'nast' from deb nast (0.2.0-10)
  command 'cat' from deb coreutils (9.4-3ubuntu6.1)
  command 'cst' from deb imx-code-signing-tool (3.3.2+dfsg-1)
See 'snap info <snapname>' for additional versions.
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ less hello.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ head hello.txt
Hello linux
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$
```

This screenshot shows the Visual Studio Code interface with the Explorer view on the left, the Code editor in the center, and the Output view on the right. The Explorer view shows a project structure with folders like .vscode, Home\_Task\_1, Lab\_02, and Lab1. The Code editor shows a file named file1.txt. The Output view shows the terminal output of the command 'ls' in the directory ~/Operating\_System/Lab\_02. The terminal output lists the files: file1.txt, file2.txt, file3.txt, and hello.txt. The terminal also shows the command 'cd Lab\_02' and the command 'mkdir -p test/sub/dir'. The terminal output for 'ls' is as follows:

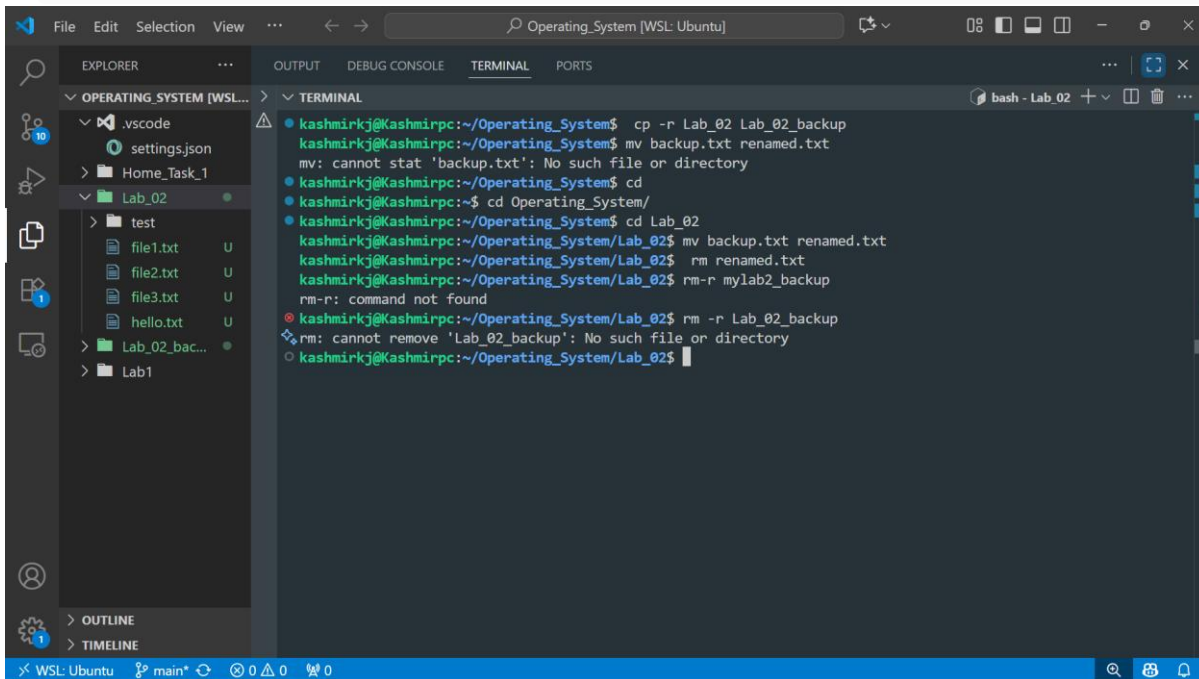
```
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ cast hello.txt
Command 'cast' not found, did you mean:
  command 'fast' from snap fast (0.0.4)
  command 'cass' from snap cass (0.17.2)
  command 'ast' from deb jruby (9.3.9.0+ds-1)
  command 'last' from deb util-linux (2.39.3-9ubuntu6.3)
  command 'cas' from deb amule-utils (1:2.3.3-3build1)
  command 'cmst' from deb cmst (2023.03.14-1)
  command 'casw' from deb epics-base (7.0.7+dfsg1-5)
  command 'nast' from deb nast (0.2.0-10)
  command 'cat' from deb coreutils (9.4-3ubuntu6.1)
  command 'cst' from deb imx-code-signing-tool (3.3.2+dfsg-1)
See 'snap info <snapname>' for additional versions.
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ less hello.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ head hello.txt
Hello linux
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ tail hello.txt
Hello linux
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ wc hello.txt
 1  2 12 hello.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$
```



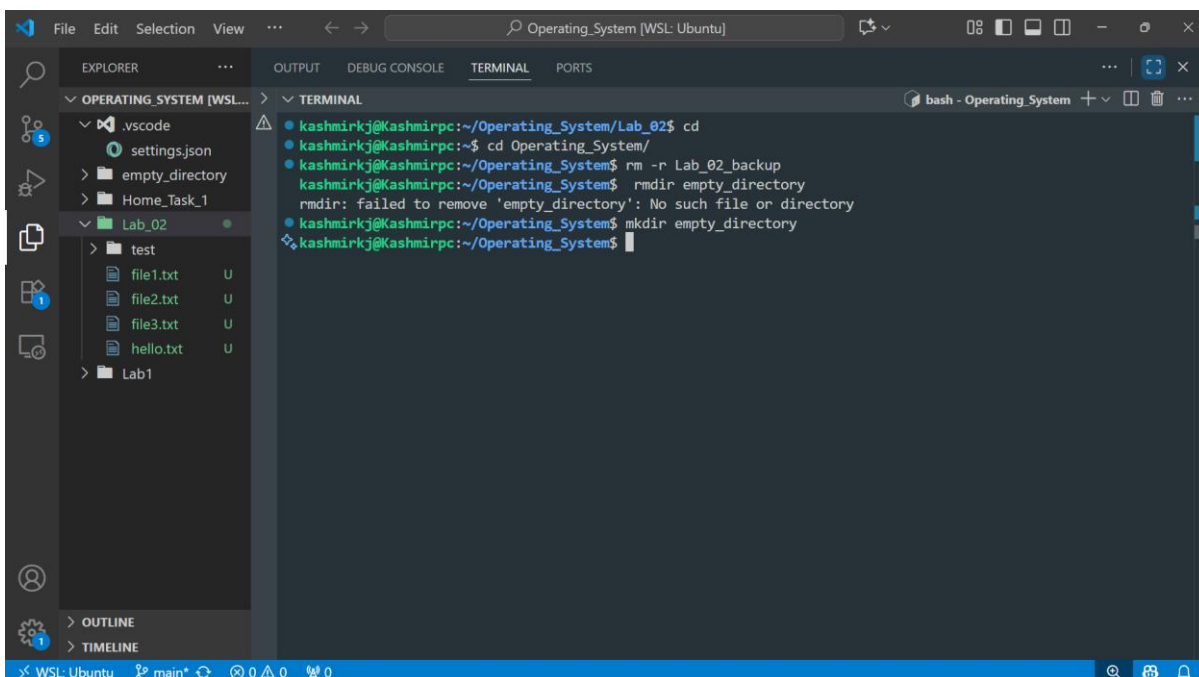
## 3.2 Copying, Moving, and Deleting

- Commands to practice:

```
cp hello.txt backup.txt           # Copy file
cp -r mylab2 mylab2_backup        # Copy directory recursively
mv backup.txt renamed.txt        # Move/rename file
rm renamed.txt                   # Remove file
rm -r mylab2_backup               # Remove directory
rmdir empty_directory             # Remove empty directory
```



A screenshot of the Visual Studio Code interface with the terminal window open. The terminal shows a series of commands and their outputs. The user is in the directory ~/Operating\_System. The commands executed are: `cp -r Lab_02 Lab_02_backup`, `mv backup.txt renamed.txt`, `cd`, `cd Operating_System/`, `cd Lab_02`, `mv backup.txt renamed.txt`, `rm renamed.txt`, `rm -r mylab2_backup`, and `rm -r Lab_02_backup`. The terminal shows errors for the last two commands: `rm: cannot stat 'backup.txt': No such file or directory` and `rm: cannot remove 'Lab_02_backup': No such file or directory`.



A screenshot of the Visual Studio Code interface with the terminal window open. The terminal shows a series of commands and their outputs. The user is in the directory ~/Operating\_System/Lab\_02. The commands executed are: `cd`, `cd Operating_System/`, `rm -r Lab_02_backup`, `rmdir empty_directory`, and `mkdir empty_directory`. The terminal shows an error for the `rmdir` command: `rmdir: failed to remove 'empty_directory': No such file or directory`.

**Hands-on Exercise:** Students create a directory structure, add files, and practice file operations.

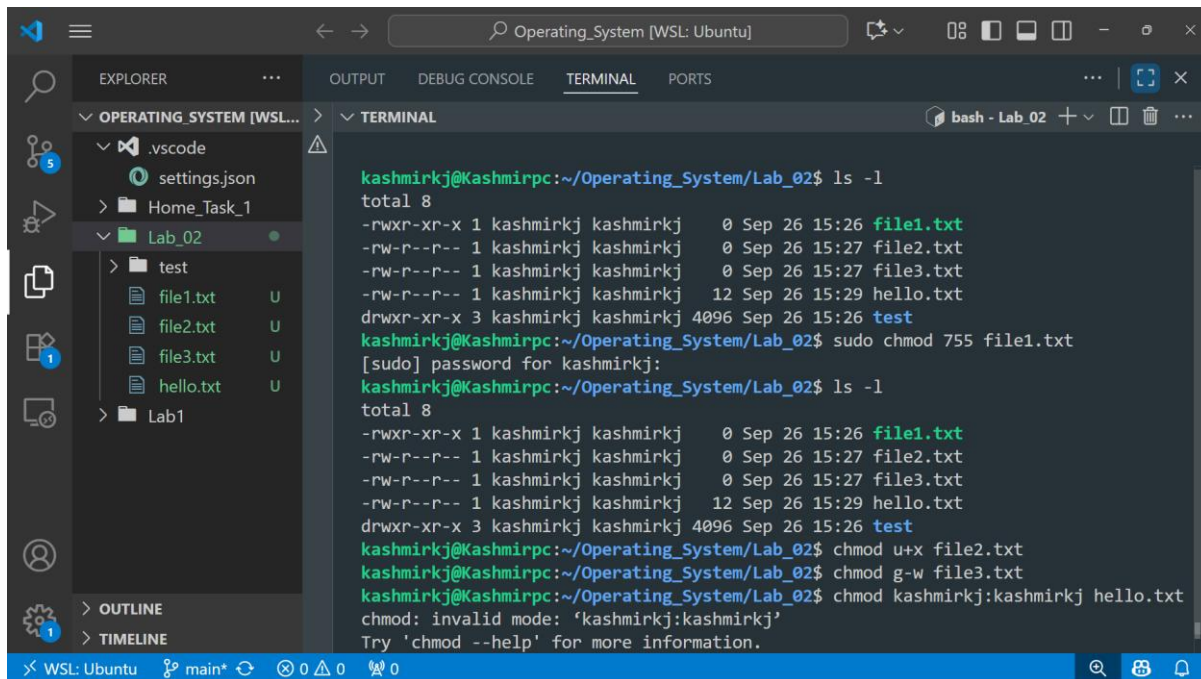
# Part 4: File Permissions and Ownership

## 4.1 Understanding File Permissions

- **Concepts to Cover:**
  - Permission types: read (r), write (w), execute (x)
  - Permission groups: user (u), group (g), others (o)
  - Numeric notation: 755, 644, etc.

- **Commands to demonstrate:**

```
ls -l          # View permissions
chmod 755 file.txt # Change permissions (numeric)
chmod u+x file.txt # Add execute permission for user
chmod g-w file.txt # Remove write permission for group
chown user:group file.txt # Change ownership (if applicable)
```



The screenshot shows the Visual Studio Code interface with a terminal window open. The terminal displays the output of the `ls -l` command, showing file permissions, owner, group, size, and date for files in the `~/Operating_System/Lab_02` directory. The files listed are `file1.txt`, `file2.txt`, `file3.txt`, `hello.txt`, and `test`. The permissions for `file1.txt` are `-rwxr-xr-x`, for `file2.txt` and `file3.txt` are `-rw-r--r--`, for `hello.txt` is `-rw-r--r--`, and for `test` is `drwxr-xr-x`. The owner is `kashmirkj` and the group is `kashmirkj`. The terminal also shows the output of the `chmod 755 file1.txt` command, which was successful. The `chown` command was not executed, and the terminal shows an error message: `chown: invalid mode: 'kashmirkj:kashmirkj'`. The terminal prompt is `kashmirkj@Kashmirpc:~/Operating_System/Lab_02$`.

```
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -l
total 8
-rwxr-xr-x 1 kashmirkj kashmirkj  0 Sep 26 15:26 file1.txt
-rw-r--r-- 1 kashmirkj kashmirkj  0 Sep 26 15:27 file2.txt
-rw-r--r-- 1 kashmirkj kashmirkj  0 Sep 26 15:27 file3.txt
-rw-r--r-- 1 kashmirkj kashmirkj 12 Sep 26 15:29 hello.txt
drwxr-xr-x 3 kashmirkj kashmirkj 4096 Sep 26 15:26 test
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ sudo chmod 755 file1.txt
[sudo] password for kashmirkj:
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -l
total 8
-rwxr-xr-x 1 kashmirkj kashmirkj  0 Sep 26 15:26 file1.txt
-rw-r--r-- 1 kashmirkj kashmirkj  0 Sep 26 15:27 file2.txt
-rw-r--r-- 1 kashmirkj kashmirkj  0 Sep 26 15:27 file3.txt
-rw-r--r-- 1 kashmirkj kashmirkj 12 Sep 26 15:29 hello.txt
drwxr-xr-x 3 kashmirkj kashmirkj 4096 Sep 26 15:26 test
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ chmod u+x file2.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ chmod g-w file3.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ chown kashmirkj:kashmirkj hello.txt
chown: invalid mode: 'kashmirkj:kashmirkj'
Try 'chown --help' for more information.
```

The screenshot shows a Visual Studio Code window with a terminal open in a WSL Ubuntu environment. The terminal displays the following commands and output:

```
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -l
total 8
-rwxr-xr-x 1 kashmirkj kashmirkj  0 Sep 26 15:26 file1.txt
-rw-r--r-- 1 kashmirkj kashmirkj  0 Sep 26 15:27 file2.txt
-rw-r--r-- 1 kashmirkj kashmirkj  0 Sep 26 15:27 file3.txt
-rw-r--r-- 1 kashmirkj kashmirkj 12 Sep 26 15:29 hello.txt
drwxr-xr-x 3 kashmirkj kashmirkj 4096 Sep 26 15:26 test
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ sudo chmod 755 file1.txt
[sudo] password for kashmirkj:
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ ls -l
total 8
-rwxr-xr-x 1 kashmirkj kashmirkj  0 Sep 26 15:26 file1.txt
-rw-r--r-- 1 kashmirkj kashmirkj  0 Sep 26 15:27 file2.txt
-rw-r--r-- 1 kashmirkj kashmirkj  0 Sep 26 15:27 file3.txt
-rw-r--r-- 1 kashmirkj kashmirkj 12 Sep 26 15:29 hello.txt
drwxr-xr-x 3 kashmirkj kashmirkj 4096 Sep 26 15:26 test
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ chmod u+x file2.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ chmod g-w file3.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ chmod kashmirkj:kashmirkj hello.txt
chmod: invalid mode: 'kashmirkj:kashmirkj'
Try 'chmod --help' for more information.
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$ chown kashmirkj:kashmirkj hello.txt
kashmirkj@Kashmirpc:~/Operating_System/Lab_02$
```

The Explorer sidebar on the left shows the file structure of the 'Lab\_02' directory, including files 'file1.txt', 'file2.txt', 'file3.txt', 'hello.txt', and a subdirectory 'test'. The status bar at the bottom indicates the current environment is 'WSL: Ubuntu' and the file is 'main\*'.