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|  <b>Marwadi University</b><br>Marwadi Chandarana Group  | <b>Marwadi University</b><br><b>Faculty of Engineering &amp; Technology</b><br><b>Department of Information and Communication Technology</b> |                                  |
| <b>Subject: Programming With Python (01CT1309)</b>                                                                                                                                                                       | <b>Aim:</b> Building a Basic User-Interactive GUI Application using Kivy in Python                                                           |                                  |
| <b>Experiment No: 16</b>                                                                                                                                                                                                 | <b>Date:</b>                                                                                                                                 | <b>Enrollment No:92510133019</b> |

**Aim:** Building a Basic User-Interactive GUI Application using Kivy in Python

**IDE:**

A comparative analysis of Tkinter and Kivy, two popular Python GUI frameworks:

| Criteria                               | Tkinter                                            | Kivy                                                      |
|----------------------------------------|----------------------------------------------------|-----------------------------------------------------------|
| <b>Origin/Integration</b>              | Built-in standard GUI toolkit for Python           | Third-party library, must be installed separately         |
| <b>Platform Support</b>                | Cross-platform (Windows, macOS, Linux)             | Cross-platform (Windows, macOS, Linux, Android, iOS)      |
| <b>Mobile App Support</b>              | Not natively supported                             | Yes, designed for mobile apps (Android/iOS)               |
| <b>Look and Feel</b>                   | Native look (uses OS elements; sometimes outdated) | Custom UI (same look on all platforms)                    |
| <b>Ease of Use (Beginner Friendly)</b> | Easier for beginners, simple widgets and layout    | Slightly steeper learning curve due to different approach |
| <b>Custom Widgets</b>                  | Limited custom widgets                             | Highly customizable, supports multi-touch, gestures       |
| <b>Performance</b>                     | Lightweight, fast for basic applications           | Better for graphics-rich or touch-based applications      |
| <b>Layout Management</b>               | Pack, Grid, Place layout managers                  | Uses relative positioning and advanced layout controls    |
| <b>Graphics and Animation</b>          | Basic support                                      | Rich support for OpenGL, animations, and gestures         |
| <b>Community and Support</b>           | Long-standing, extensive community                 | Newer but active open-source community                    |
| <b>Event Handling</b>                  | Traditional event binding using command and bind   | Event-driven, uses Clock, on_touch_*, properties          |
| <b>Development Use Case</b>            | Desktop apps, simple tools, admin panels           | Mobile apps, multimedia apps, dashboards, games           |

|                                                                                                                                        |                                                                                                                                              |                                  |  |
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### Use Tkinter:

You are developing a simple desktop application, teaching basic GUI programming, or need something lightweight and native-looking on desktops.

### Use Kivy:

You are targeting mobile platforms, want touch support, need consistent UI across devices, or are building multimedia-rich or gesture-based apps.

| Library           | Purpose / UI Type                          | Installation                      | Import Syntax                     | Best Use Case                                    |
|-------------------|--------------------------------------------|-----------------------------------|-----------------------------------|--------------------------------------------------|
| <b>Tkinter</b>    | Native Desktop GUI                         | Built-in<br>(python3-tk on Linux) | import tkinter as tk              | Basic desktop apps, learning GUI concepts        |
| <b>Kivy</b>       | Multi-touch apps for desktop & mobile      | pip install kivy                  | from kivy.app import App          | Mobile-like UIs, gesture support, kiosk apps     |
| <b>Textual</b>    | Terminal UI with app-like look             | pip install textual               | from textual.app import App       | Terminal dashboards, TUI-based dev tools         |
| <b>Remi</b>       | Web UI from pure Python (no HTML)          | pip install remi                  | import remi.gui as gui            | Turn Python scripts into web apps easily         |
| <b>NiceGUI</b>    | Fast web UI with Vue3 + Python             | pip install nicegui               | from nicegui import ui            | Reactive dashboards, IoT UI, admin panels        |
| <b>Flet</b>       | Flutter-style UI in pure Python            | pip install flet                  | import flet as ft                 | Mobile/web-style apps, no need for Dart          |
| <b>Eel</b>        | HTML/JS frontend + Python backend          | pip install eel                   | import eel                        | Convert HTML+JS UI into desktop apps with Python |
| <b>Dear PyGui</b> | GPU-accelerated desktop GUI                | pip install dearpygui             | import dearpygui.dearpygui as dpg | High-perf apps, dashboards, tools with fast UI   |
| <b>pywebview</b>  | Native desktop app with embedded web UI    | pip install pywebview             | import webview                    | Build web UI as desktop apps with native look    |
| <b>Toga</b>       | Native UI for desktop/mobile (BeeWare)     | pip install toga                  | import toga                       | Native look across macOS, Windows, Linux         |
| <b>JustPy</b>     | Server-side reactive web UI (no JS needed) | pip install justpy                | import justpy as jp               | Dashboards, education tools, reactive forms      |
| <b>Goody</b>      | Turn CLI apps into                         | pip install goody                 | from goody import                 | Beautify CLI tools,                              |

|                                                                                                                                        |                                                                                                                                              |                                  |  |
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|  |               |  |        |                               |
|--|---------------|--|--------|-------------------------------|
|  | GUI instantly |  | Goovey | Python scripts for non-coders |
|--|---------------|--|--------|-------------------------------|

Example Syntax Comparison:

#### Tkinter Button Example:

```
import tkinter as tk
```

```
def say_hello():
    print("Hello, Tkinter!")
```

```
root = tk.Tk()
btn = tk.Button(root, text="Click Me", command=say_hello)
btn.pack()
root.mainloop()
```

#### Kivy Button Example:

```
from kivy.app import App
from kivy.uix.button import Button
```

```
class MyApp(App):
    def build(self):
        return Button(text='Click Me', on_press=lambda x: print("Hello, Kivy!"))
```

```
MyApp().run()
```

Kivy was first released in early 2011. This cross-platform Python framework can be deployed to Windows, Mac, Linux, and Raspberry Pi. It supports multitouch events in addition to regular keyboard and mouse inputs. Kivy even supports GPU acceleration of its graphics, since they're built using OpenGL ES2.

|                                                                                                                                        |                                                                                                                                              |                                  |
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Before using Kivy, you need to install it. You can install it using pip:  
pip install kivy

Create a Simple Kivy Application

Let's start by building a basic app with a label and a button.

# Importing necessary modules from kivy

from kivy.app import App

from kivy.uix.button import Button

from kivy.uix.label import Label

from kivy.uix.boxlayout import BoxLayout

# Defining the main application class

class SimpleApp(App):

def build(self):

# Creating a layout

layout = BoxLayout(orientation='vertical')

# Creating a label and adding it to the layout

self.label = Label(text="Hello, ICT Department")

layout.add\_widget(self.label)

# Creating a button, binding it to the on\_button\_press function, and adding it to the layout

button = Button(text="Click Me!")

button.bind(on\_press=self.on\_button\_press)

layout.add\_widget(button)

# Returning the layout to be displayed

return layout

# Function to handle button click event

def on\_button\_press(self, instance):

self.label.text = "Button Clicked!"

# Running the application

|                                                                                                                                        |                                                                                                                                              |                                  |
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```
if __name__ == '__main__':
    SimpleApp().run()
```

### Kivy Login Page Example

```
from kivy.app import App
from kivy.uix.boxlayout import BoxLayout
from kivy.uix.label import Label
from kivy.uix.textinput import TextInput
from kivy.uix.button import Button

# Defining the main application class
class LoginApp(App):
    def build(self):
        # Main layout
        layout = BoxLayout(orientation='vertical', padding=10, spacing=10)

        # Username label and input
        self.username_label = Label(text="Username:")
        layout.add_widget(self.username_label)

        self.username_input = TextInput(multiline=False)
        layout.add_widget(self.username_input)

        # Password label and input
        self.password_label = Label(text="Password:")
        layout.add_widget(self.password_label)

        self.password_input = TextInput(password=True, multiline=False)
        layout.add_widget(self.password_input)

        # Login button
        self.login_button = Button(text="Login")
        self.login_button.bind(on_press=self.check_credentials)
        layout.add_widget(self.login_button)
```

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```
# Label to display the login status
self.status_label = Label(text="")
layout.add_widget(self.status_label)
```

```
return layout
```

```
# Function to check the credentials
def check_credentials(self, instance):
    username = self.username_input.text
    password = self.password_input.text
```

```
# Simple validation (hardcoded username/password for demonstration)
if username == "admin" and password == "password":
    self.status_label.text = "Login Successful"
    self.status_label.color = (0, 1, 0, 1) # Green color for success
else:
    self.status_label.text = "Invalid Credentials"
    self.status_label.color = (1, 0, 0, 1) # Red color for error
```

```
# Running the application
if __name__ == '__main__':
    LoginApp().run()
```

Calculator App Using Kivy

```
from kivy.app import App
from kivy.uix.gridlayout import GridLayout
from kivy.uix.button import Button
from kivy.uix.textinput import TextInput
```

```
# Defining the calculator layout and logic
class CalculatorGrid(GridLayout):
    def __init__(self, **kwargs):
        super(CalculatorGrid, self).__init__(**kwargs)
        self.cols = 4 # Grid layout with 4 columns
```

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```
# TextInput field to display the calculation results
self.result = TextInput(font_size=32, readonly=True, halign="right", multiline=False)
self.add_widget(self.result)
```

```
# Buttons for numbers and operations
```

```
buttons = [
    '7', '8', '9', '/',
    '4', '5', '6', '*',
    '1', '2', '3', '-',
    '.', '0', '=', '+'
]
```

```
# Adding buttons to the layout
```

```
for button in buttons:
```

```
    self.add_widget(Button(text=button, font_size=24, on_press=self.on_button_press))
```

```
# Clear button to reset the calculator
```

```
self.add_widget(Button(text="C", font_size=24, on_press=self.clear_result))
```

```
# Function to handle button press events
```

```
def on_button_press(self, instance):
```

```
    current_text = self.result.text
```

```
    button_text = instance.text
```

```
# If the equals sign is pressed, evaluate the expression
```

```
if button_text == "=":
```

```
    try:
```

```
        self.result.text = str(eval(current_text))
```

```
    except Exception:
```

```
        self.result.text = "Error"
```

```
else:
```

```
    # Otherwise, append the pressed button's text to the current expression
```

```
    if current_text == "Error":
```

```
        self.result.text = button_text # Reset the result if there's an error
```

```
    else:
```

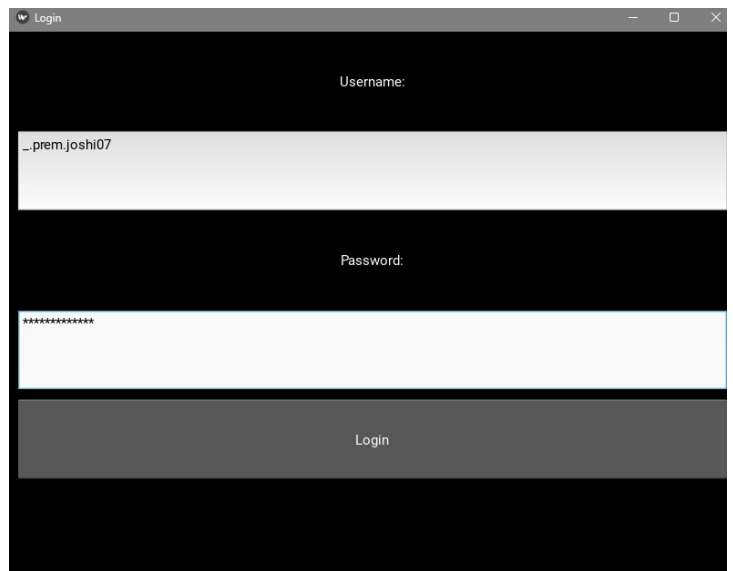
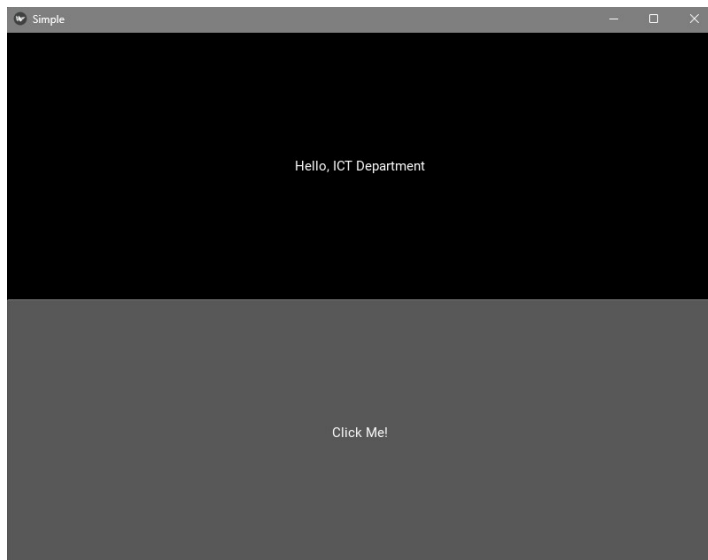
```
        self.result.text += button_text
```

|                                                                                                                                                                                                                          |                                                                                                                                              |                                  |
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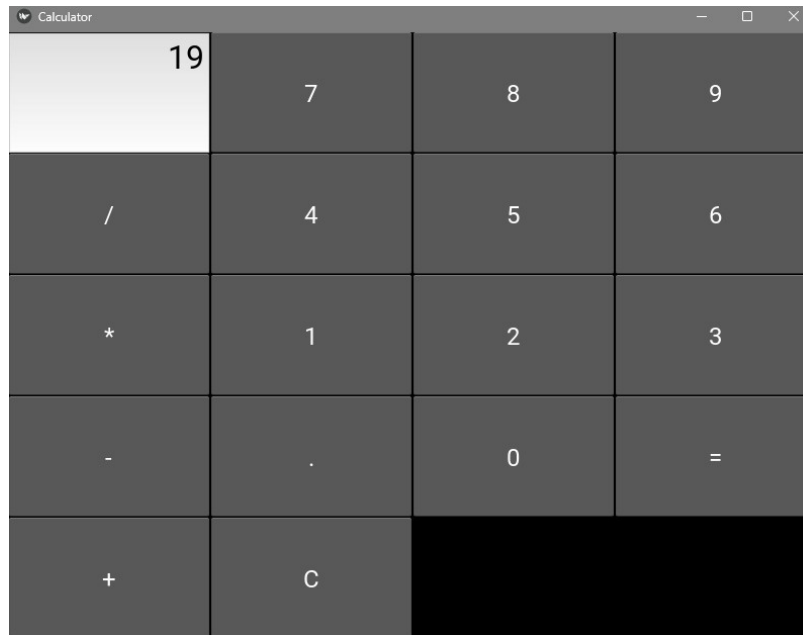
```
# Function to clear the result field
def clear_result(self, instance):
    self.result.text = ""
```

```
# Main App class
class CalculatorApp(App):
    def build(self):
        return CalculatorGrid()
```

```
# Running the application
if __name__ == '__main__':
    CalculatorApp().run()
```

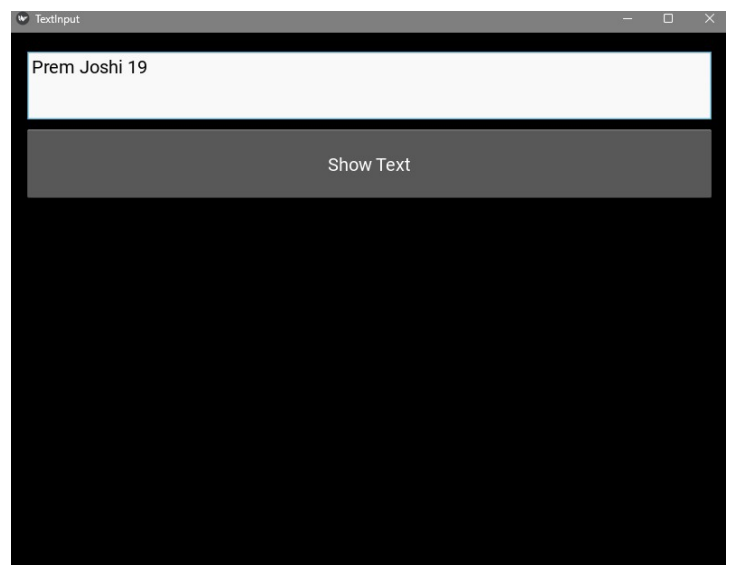
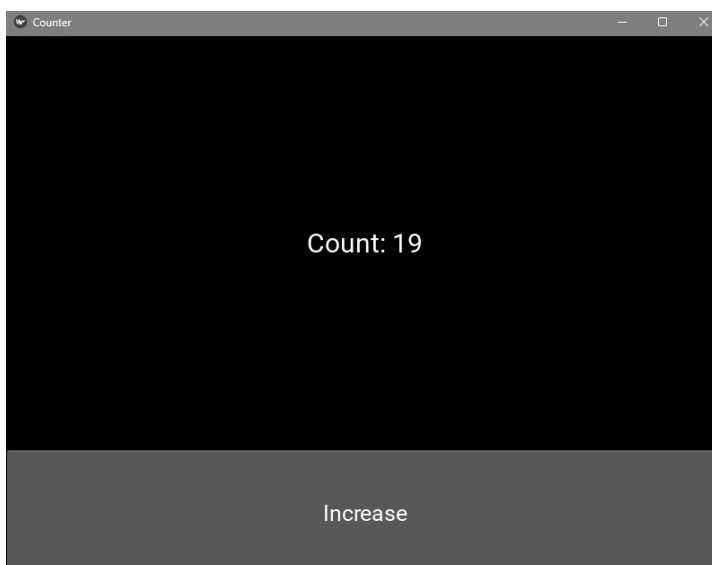


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### Post Lab Exercise:

- Design Counter App (This app has a button that increments a counter displayed on the screen every time the button is clicked)



|                                                                                                                                        |                                                                                                                                              |                                  |
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- Text Input App (This app allows users to type in a text field and display the typed text on the screen when a button is pressed.)

