CSE 1203

Object Oriented Programming

Java GUI Programming -01

Java: Swing

Java: swing

Java Swing is a part of Java Foundation Classes (JFC) that is *used to create window-based applications*. It is built on the top of AWT (Abstract Windowing Toolkit) API and entirely written in java.
The `javax.swing` package provides classes for java swing API such as `JButton`, `JTextField`, `JTextArea`, `JRadioButton`, JCheckbox, `JMenu`, `JColorChooser` etc.

Java: awt vs swing

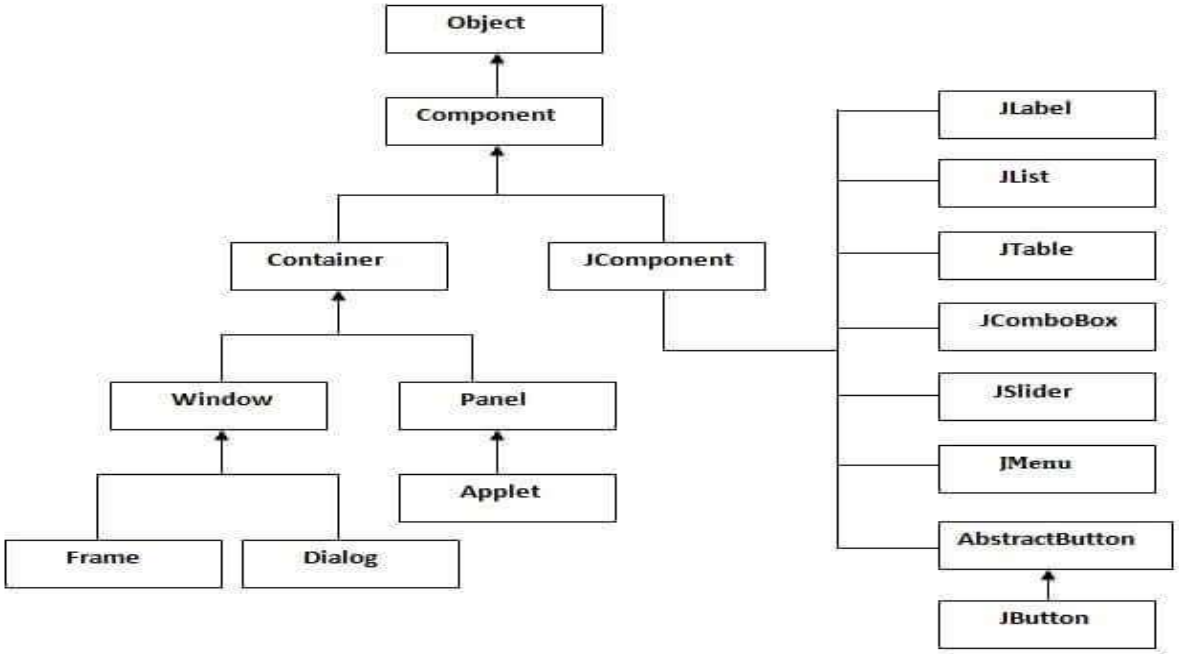
AWT (Abstract Window Toolkit)

- >It was platform-dependent
- >It was heavy-weight
- >It has a limited set of components

Swing

- >It is platform-independent
- >It is light-weight
- >It has more & powerful components

Java: Hierarchy of Swing classes



Java: swing topics

- >Basic Components
- >Applications
- >Event Listeners
- >Layouts Managers
- >Some Advance Components
- >Layers Of JFrame
- >Look and Feel
- >Projects

Creating Frame:
JFrame

Java: JFrame

Java swing: JFrame class

The class **JFrame** is an extended version of **java.awt.Frame** that adds support for the JFC/Swing component architecture. It is like a board where you can add your swing objects

Java: swing methods

setVisible()
setDefaultCloseOperation()
setSize()
setLocation()
setBounds()
setIconImage()
setTitle()
setBackground()
setResizable()

Java swing Frame: ways to create frame

Methods:

1. By creating the object of Frame class (association)
2. By extending Frame class (inheritance)
3. Create a frame using Swing inside main()

Java swing Frame: way 1 to create frame

```
package CSE1203;
import javax.swing.JFrame;
import javax.swing.*;

public class First {
    JFrame frame;
    First()
    {
        frame=new JFrame("first way");
        // setting close operation
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

        // sets 500 width and 600 height
        frame.setSize(500, 600);

        // makes the frame visible
        frame.setVisible(true);
    }
    public static void main(String[] args) {
        new First(); //anonymous object
        //First f=new First() is similar
    }
}
```

Notes A frame frame object is created in the constructor of First class. For JFrame class import `javax.swing.JFrame;`

Java: JFrame

Java swing Frame: way 2 to create frame

```
package CSE1203;
import javax.swing.*;

public class First extends JFrame {

First()
    {
        setTitle("this is also a title");
// setting close operation
  setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

        setSize(400, 500);
        setVisible(true);
    }
    public static void main(String[] args)
    {
        First f=new First() is similar
    }
}
```

Notes here First class is inherited by Jframe class. So object of Jframe class can use the methods of Jframe class. The methods includes `setTitle(), setSize(), setVisible` etc.

Java swing Frame: way 3 to create frame

```
package CSE1203;
import javax.swing.JFrame;
public class First {
 public static void main(String[] args) {
   JFrame frame=new JFrame("CSE 1203");
   frame.setSize(600,400);
   frame.setLocation(200,100);
   //frame.setBounds(200,100,200,300);
   frame.setVisible(true);
   frame.setDefaultCloseOperation(frame.EXIT_ON_C
LOSE);
 }
}
```

Notes A frame of size 600x400 will be created at location display point (200,100). The frame is visible and it would be closed when x button is clicked.

getContentPane()

ImageIcon

Color(color)

setResizable()

```
import javax.swing.ImageIcon;
import javax.swing.JFrame;
import java.awt.Color;
import java.awt.Container;
```

Java: ImageIcon

Java swing : ImageIcon class

```
ImageIcon icon=new
ImageIcon("F:\\Zaman\\Image\\login.png");
frame.setIconImage(icon.getImage());
```

Notes Adding a new icon at the top upper corner of the frame.

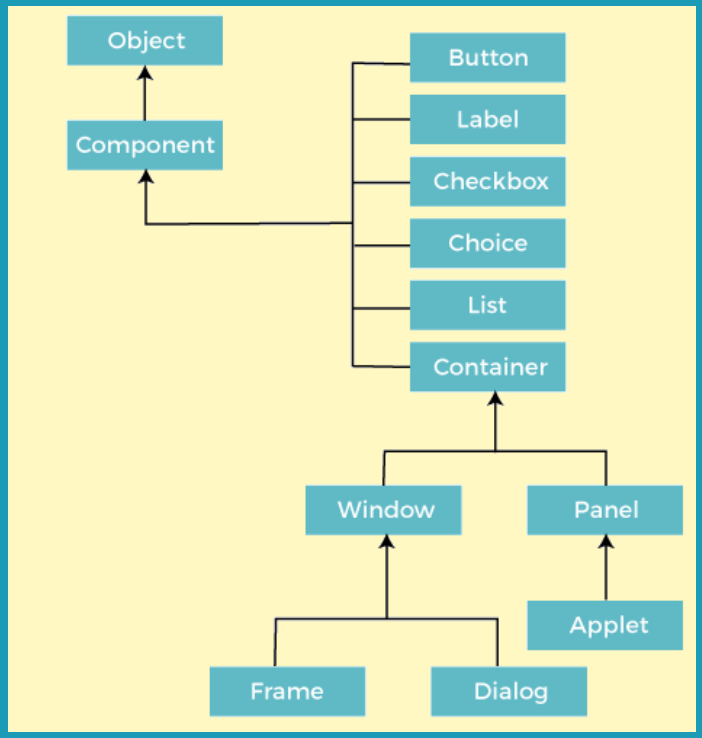
Java AWT : Container

The Container is a component in AWT that can contain another components like buttons, textfields, labels etc. The classes that extends Container class are known as container such as Frame, Dialog and Panel.

It is basically a screen where the where the components are placed at their specific locations. Thus it contains and controls the layout of components.

```
Container c=frame.getContentPane();
c.setBackground(Color.RED);
//create color object
//Color color=new Color(255,0,0)
//c.setBackground(color);
```

Notes To change the background of the frame, first create a **Container** class object then set its background color using **Color** class



Java swing : JFrame setResizable()

```
frame.setResizable(false);
```

Notes If the argument is `false`, the frame cann't be resized.

Jlabel

Font

setText()

setFont()

add()

```
import java.awt.Font;
import javax.swing.JLabel
```

Java: JLabel

Java swing : Jlabel class

```
JFrame frame=new JFrame("JLabel");
        frame.setBounds(200, 100,400,300);
        frame.setVisible(true);

frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        Container c=frame.getContentPane();
        c.setLayout(null);
        JLabel label=new JLabel("Username:");
        //label.setText("User Name:");
        label.setBounds(50,70,100,30);
        c.add(label);
```

Java swing : Font class

```
Font font=new Font("Arial",Font.PLAIN,12);
label.setFont(font);
```

Notes Font class constructor requires three parameters like Font name, Font type and Font size

Java swing : ImageIcon with JLabel class

```
ImageIcon icon=new
ImageIcon("F:\\Zaman\\Image\\Apple.png");
        JLabel label=new
JLabel("Apple",icon,JLabel.LEFT);
        label.setBounds(50,70,500,200);
        c.add(label);
        frame.setVisible(true);
```

Notes Jlabel constructor take 3 arguments text, icon and position

Java swing : Jlabel add image

```
ImageIcon image=new ImageIcon("F:\\Zaman\\Image\\Apple.png");
JLabel label=new JLabel(image);
c=this.getContentPane();
        c.setLayout(null);
        label.setBounds(100,178,image.getIconWidth(),image.getIconHeight());
        c.add(label);
```

JTextField
JPasswordField

setText()
setEditable()
setForeground()
setBackground()
setEchoChar()

```
import javax.swing.JTextField
import javax.swing.JPasswordField
```

Java: JTextField & JPasswordField

Java swing : JTextField

```
JTextField text=new JTextField();
 text.setText("type here");
 text.setBounds(50,30,100,20);
 text.setForeground(Color.blue);
 text.setBackground(Color.cyan);
 text.setEditable(true);
 c.add(text);
```

Notes: `JTextField()` is a input box

Java swing : JPasswordText class

```
JPasswordField text=new JPasswordField();
        text.setBounds(50,30,100,20);
        text.setForeground(Color.blue);
        text.setBackground(Color.cyan);
        text.setEchoChar('*');
        text.setEchoChar((char)0); //show
        text.setEditable(true);
        c.add(text);
```

JButton
JCursor

setBounds()
setCursor()

```
import javax.swing.JButton
  import java.awt.Cursor
```

Java: JTextField & JPasswordField

Java swing : JButton & Cursor class

```
JButton btn=new JButton("Submit");
btn.setBounds(100,50,100,30);
Cursor cursor=new Cursor(Cursor.HAND_CURSOR);
btn.setCursor(cursor);
btn.setEnabled(false);
c.add(btn);
```

Notes when cursor moves inside button Hand cursor is displayed. To disable the button use `setEnabled()` to `false`

Java: JRadioButton

Java swing : JRadioButton is used to select one from many

```
JRadioButton rb1=new JRadioButton();
JRadioButton rb2=new JRadioButton();
ButtonGroup bg=new ButtonGroup();

    rb1.setBounds(400,200,70,30);
    rb1.setText("Male");
    rb1.setBackground(color);
    c.add(rb1);

    rb2.setBounds(400,240,70,30);
    rb2.setText("Female");
    rb2.setBackground(color);
    c.add(rb2);

    bg.add(rb1);
    bg.add(rb2);
```

Notes ButtonGroup() : Use to create a group, in which we can add JRadioButton. We can select only one JRadioButton in a ButtonGroup.

Java: JCheckBox & JTextArea

Java swing : JCheckBox

```
JCheckBox cb=new JCheckBox();

  cb.setBounds(400,340,70,30);
  cb.setText("Agree");
  cb.setBackground(color);
  c.add(cb);
```

Notes The JCheckBox class is used to create a checkbox. It is used to turn an option on (true) or off (false). Clicking on a CheckBox changes its state from "on" to "off" or from "off" to "on ".It inherits JToggleButton class.

Java swing : JTextArea

```
JTextArea txt=new JTextArea();

        c=this.getContentPane();
        c.setLayout(null);
        txt.setBounds(100,10,400,300);
        txt.setBackground(Color.RED);
        c.add(txt);
```

The object of a JTextArea class is a multi line region that displays text. It allows the editing of multiple line text. It inherits JTextComponent class

Java: JTable

The JTable class is used to display data in tabular form. It is composed of rows and columns.

```
JTable jt;
    String data[][]={
                        {"100","Belal","1200"},
                        {"200","Aslam","1700"},
                        {"300","Kamal","1100"},
                        {"800","Kamal","9000"}
                    };
    String columns[]={"AcN-","-Name-","-Balance-"};
//inside constructor
        jt=new JTable(data,columns);
        jt=new JTable(data,columns);
        jt.setBounds(50,50,250,270);
        jt.setFont(font);
        c.add(jt);
```

Java: JScrollPane

A JscrollPane is used to make scrollable view of a component. When screen size is limited, we use a scroll pane to display a large component or a component whose size can change dynamically.

```
JTable jt;
    String data[][]={
                        {"100","Belal","1200"},
                        {"200","Aslam","1700"},
                        {"300","Kamal","1100"},
                        {"800","Kamal","9000"}
                    };
    String columns[]={"AcN-","-Name-","-Balance-"};
//inside constructor
        jt=new JTable(data,columns);
        //jt.setBounds(50,50,250,270);
        //jt.setFont(font);
        //c.add(jt);
        JScrollPane sp=new JScrollPane(jt);
        sp.setHorizontalScrollBarPolicy(JScrollPane.HORIZONTAL_SCROLL
BAR_ALWAYS);
        sp.setBounds(50,50,250,170);
        c.add(sp);
```

Java: JList

The object of JList class represents a list of text items. The list of text items can be set up so that the user can choose either one item or multiple items. It inherits JComponent class.

```
JList jl;
String days[]={"Sunday","Monday","Tuesday","Wednesday","Thursday"};
  jl=new JList(days);
        jl=new JList(days);
        jl.setBounds(50,50,100,100);
        jt.setFont(font);
        c.add(jl);
```

Adding Scroll Bar

```
JList jl;
String days[]={"Sunday","Monday","Tuesday","Wednesday","Thursday"};
  jl=new JList(days);
        jl=new JList(days);
        JScrollPane sp=new JScrollPane(jl);
        sp.setBounds(50,50,70,70);
        c.add(sp);
```

Java: JComboBox

JComboBox shows a popup menu that shows a list and the user can select a option from that specified list .

```
DefaultComboBoxModel cb=new DefaultComboBoxModel<>();
//inside constructor
        cb.addElement("Dhaka");
        cb.addElement("Rajshahi");
        JComboBox jcb=new JComboBox<>(cb);
        jcb.setBounds(50,50,100,40);
        jcb.setSelectedIndex(0);
        c.add(jcb);
```

Another approach

```
String days[]={"Sunday","Monday","Tuesday","Wednesday","Thursday"};
    JComboBox cb=new JComboBox<>(days);
//inside constructor
        cb.setBounds(50,50,100,30);
        cb.setSelectedIndex(1);
        cb.setEditable(true);
        c.add(cb);
```

Java: inheritance

Java swing : ActionListener

The Java ActionListener is notified whenever you click on the button or menu item. It is notified against ActionEvent. The ActionListener interface is found in java.awt.event package. It has only one method: actionPerformed().

Java swing : actionPerformed() method

The `actionPerformed()` method is invoked automatically whenever you click on the registered component.

```
public abstract void actionPerformed(ActionEvent e);
```

Java swing :How to implement ActionListener

ActionListener class, you need to follow 3 steps:

1) Implement the ActionListener interface in the class:

```
public class ActionListenerExample Implements
     ActionListener
```

2) Register the component with the Listener:

```
component.addActionListener(instanceOfListenerclass);
```

3) Override the actionPerformed() method:

```
public void actionPerformed(ActionEvent e){
      //Write the code here
}
```

Java: inheritance

Java swing : use of ActionListener interface

```
package CSE1203;

import java.awt.Color;
import java.awt.Container;
import java.awt.Cursor;
import java.awt.Font;
import java.awt.Image;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.util.List;

import javax.swing.*;
class MyFrame extends JFrame implements
ActionListener{
Container c;
JButton btn1,btn2;
JLabel label;
public MyFrame() {
c=this.getContentPane();
        c.setLayout(null);
        btn1=new JButton("Submit");
        btn1.setBounds(100,50,100,30);
        btn2=new JButton("Cancel");
        btn2.setBounds(210,50,100,30);
        label=new JLabel();
        label.setBounds(110,110,400,30);
        label.setText("Output Displays here");
        btn1.addActionListener(this);
        btn2.addActionListener(this);
        c.add(btn1);
```

```
  public void actionPerformed(ActionEvent e) {
     if(e.getSource()==btn1)
     label.setText("Submit Button Pressed");
     if(e.getSource()==btn2)
     label.setText("Cancel Button Pressed");
  }
}
public class First {
    public static void main(String[] args)
    {
        MyFrame frame=new MyFrame();
        frame.setBounds(200, 100,400,500);
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setVisible(true);

    }
}
```

Notes: When a button is clicked, through addActionListener() method it invokes actionPerformed() automatically. Using object e inside the actionPerformed() method check which button is clicked and setText() in label accordingly.

Java: inheritance

Java swing : use of ActionListener interface

```
package CSE1203;

import java.awt.Color;
import java.awt.Container;
import java.awt.Cursor;
import java.awt.Font;
import java.awt.Image;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.util.List;

import javax.swing.*;
class MyFrame extends JFrame{
Container c;
JButton btn1,btn2;
JLabel label;
public MyFrame() {
c=this.getContentPane();
        c.setLayout(null);
        btn1=new JButton("Submit");
        btn1.setBounds(100,50,100,30);
        btn2=new JButton("Cancel");
        btn2.setBounds(210,50,100,30);
        label=new JLabel();
        label.setBounds(110,110,400,30);
        label.setText("Output Displays here");
 btn1.addActionListener(new ActionListener() {
   public void actionPerformed(ActionEvent e) {
     label.setText("Submit is pressed");
   }
 });
 btn2.addActionListener(new ActionListener() {
   public void actionPerformed(ActionEvent e) {
     label.setText("Cancel is pressed");
   }
 });
        c.add(btn1);
        c.add(btn2);
        c.add(label);
}
}
public class First {
    public static void main(String[] args)  {
        MyFrame frame=new MyFrame();
        frame.setBounds(200, 100,400,500);
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setVisible(true);
    }
}
```

Notes: When AddActionListener is called, its parameter is the object of interface and in the same time abstract method actionPermored() is overrriden. Here no need to create a class to override actionPerformed().

Java: Swing Example

Java swing : login form

```
package CSE1203;

import java.awt.Color;
import java.awt.Container;
import java.awt.Cursor;
import java.awt.Font;
import java.awt.Image;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.util.List;

import javax.swing.*;
class MyFrame extends JFrame
implements ActionListener{
Container c;
JButton btn1,btn2;
JLabel label1,label2,label9;
JTextField text1,text2;
JPasswordField pass1;

String[] username= {"zaman","kamal"};
String[] password= {"123","user"};

public MyFrame() {
    c=this.getContentPane();
        c.setLayout(null);

        label1=new JLabel("Username");

label1.setBounds(50,50,100,30);
        text1=new JTextField();

text1.setBounds(120,50,180,30);
```

```
 label2=new JLabel("Password");

label2.setBounds(50,80,100,30);
        pass1=new JPasswordField();

pass1.setBounds(120,80,180,30);

          btn1=new JButton("Cancel");

btn1.setBounds(100,150,100,30);
          btn2=new JButton("Login");

btn2.setBounds(210,150,100,30);

          label9=new JLabel();

label9.setBounds(120,200,180,30);

        btn1.addActionListener(this);
        btn2.addActionListener(this);

        c.add(label1);
        c.add(text1);
        c.add(label2);
        c.add(pass1);
        c.add(btn1);
        c.add(btn2);
        c.add(label9);
}
```

```
public void actionPerformed(ActionEvent
e) {
  int flag=0;
  String s=new
String(pass1.getPassword());
  if(e.getSource()==btn1)
  dispose(); //close the frame
  if(e.getSource()==btn2) {
  for(int i=0;i<username.length;i++) {
if(username[i].equals(text1.getText()))
if(password[i].equals(s))
 flag++;
  }
  if(flag==1)
    label9.setText("Valid User");
  else
label9.setText("Worng
username/password");
  }
 }
}
public class First {
    public static void main(String[]
args) {
        MyFrame frame=new MyFrame();
        frame.setBounds(200,
100,400,500);
frame.setDefaultCloseOperation(JFrame.E
XIT_ON_CLOSE);
        frame.setVisible(true);
    }
}
```

Java: Swing

Java swing : JTextArea class

```
c=this.getContentPane();
c.setLayout(null);
JTextArea area=new JTextArea();
area.setBounds(100,50,200,150);
area.setBackground(Color.BLUE);
area.setForeground(Color.white);
area.setLineWrap(true);
c.add(area);
```

Notes This method is used to input a text in a text area.

Java swing : JRadioButton & ButtonGroup class

```
package CSE1203;

import java.awt.Color;
import java.awt.Container;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import javax.swing.*;

class MyFrame extends JFrame implements
ActionListener{
Container c;
JRadioButton rb1,rb2;
public MyFrame() {
        c=this.getContentPane();
        c.setLayout(null);
        rb1=new JRadioButton("Male");
        rb1.setBounds(100,50,200,30);
        rb1.setSelected(true)
        rb2=new JRadioButton("Female");
        rb2.setBounds(100,80,200,30);
        ButtonGroup bg=new ButtonGroup();
        bg.add(rb1);  bg.add(rb2);
        rb1.addActionListener(this);
        rb2.addActionListener(this);
        c.add(rb1);  c.add(rb2);
}
public void actionPerformed(ActionEvent e) {
if(rb1.isSelected()){
JOptionPane.showMessageDialog(this,"You are
Male.");
}
if(rb2.isSelected()){
JOptionPane.showMessageDialog(this,"You are
Female.");
}
}
}
public class First {
    public static void main(String[] args) {
        MyFrame frame=new MyFrame();
        frame.setBounds(200, 100,400,500);
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setVisible(true);
    }
}
```

Notes ButtonGroup class combines the buttons in one group ie only one can be selected from the group.

Java: Swing

Java swing : JcheckBox class

```
package CSE1203;
import java.awt.Container;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import javax.swing.*;
class MyFrame extends JFrame implements
ActionListener{
 Container c;
 JCheckBox check;
 JButton btn1,btn2;
 public MyFrame() {
        c=this.getContentPane();
        c.setLayout(null);
        check=new JCheckBox("I agree");
        check.setBounds(100,80,200,30);
        btn1=new JButton("Cancel");
        btn1.setBounds(100,130,80,30);
        btn2=new JButton("Next");
        btn2.setBounds(180,130,80,30);
        btn2.setEnabled(false);
        check.addActionListener(this);
        c.add(check); c.add(btn1); c.add(btn2);
}
public void actionPerformed(ActionEvent e) {
   if(check.isSelected())
      btn2.setEnabled(true);
   else
      btn2.setEnabled(false);
 }
}
```

```
public class First {
    public static void main(String[] args)
    {
        MyFrame frame=new MyFrame();
        frame.setBounds(200, 100,400,500);
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE
);
        frame.setVisible(true);

    }
}
```

Notes Initially Next Button is disabled. When check box is selected then Next button would be enabled.

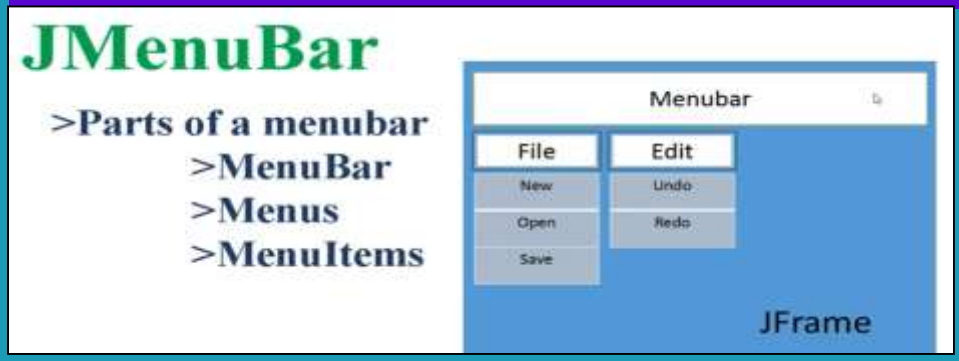
Java: Swing

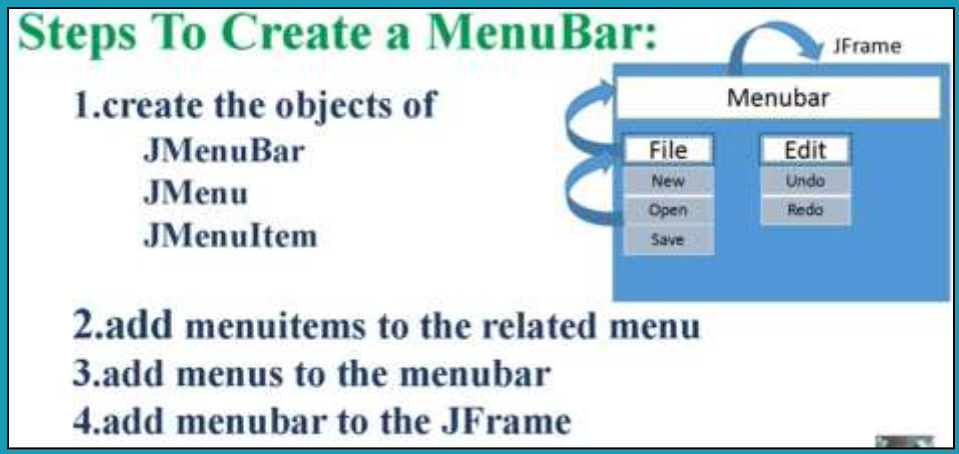
Java swing : JComboBox class

```
package CSE1203;
import java.awt.Container;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import javax.swing.*;
class MyFrame extends JFrame implements
ActionListener{
Container c;
JComboBox combo;
String[] ax=
{"Australia","Banglades","India","Japan","Malays
ia"};
String[] bx= {"Canberra","Dhaka","New
Delhi","Tokyo","Kualalumpur"};
public MyFrame() {
    c=this.getContentPane();
        c.setLayout(null);
        combo=new JComboBox(ax);
        combo.setSelectedIndex(1);
        combo.setBounds(100,80,200,30);
combo.addActionListener(this);
        c.add(combo);
}
public void actionPerformed(ActionEvent e) {
//String s=(String) combo.getSelectedItem();
int i=combo.getSelectedIndex();
JOptionPane.showMessageDialog(this,"Capital:"+bx
[i]);
}
}
```

Notes There are two arrays ax and bx contains contry and capital name respectively. When user select a country from combobox then in the actionPerformed() method selected country index is stored in i. Finally, capital bx[i] is displayed in dialog box.
The main() method is NOT written here, it is similar to the previous one.

Java swing : JMenuBar class





THANK YOU