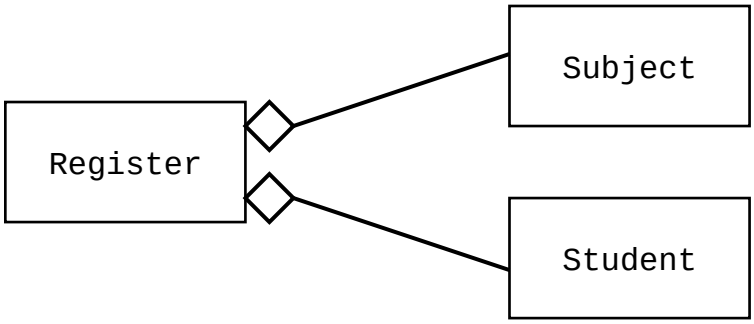
บทที่ 9 การออกแบบ Class แบบ Composition และใช้งาน Garbage Collection

การออกแบบและสร้าง Class แบบ Composition เพื่อเก็บข้อมูลการลงทะเบียน โดยมีการออกแบบ Class ตาม Class Diagram ดังนี้

Subject
- SubjectCode : String - SubjectName : String - SubjectCredit : int
+ Subject() + Subject(String Code, String Name, int Credit) + setSubjectCode(String Code) : void + setSubjectName(String Name) : void + setSubjectCredit(int Credit): void + getSubjectCode() : String + getSubjectName() : String + getSubjectCredit() : int + toString() : String

Student
- StudentCode : String - StudentName : String - StudentSurName : String
+ Student() + Student(String Code, String Name, String SurName) + setStudentCode(String Code) : void + setStudentName(String Name) : void + setStudentSurName(String SurName): void + getStudentCode() : String + getStudentName() : String + getStudentSurName() : String + toString() : String

Register
- std : Student - sub[] : Subject - max : int - count : int = -1
+ Register() + Register(Student std , int n) - createSubject(int n) : void + setStudent(Student std) : void + setSubject(Subject sub) : void + setStudentSurName(String SurName): void + setSubject(Subject sub, int n) : void + getStudent() : String + getSubject(int n) : String



การทดลองที่ 9-1

```
// File Name : Subject.java
public class Subject {
   private String SubjectCode;
   private String SubjectName;
   private int  SubjectCredit;

   /** Creates a new instance of Subject */
   public Subject() {
      setSubjectCode("");
      setSubjectName("");
      setSubjectCredit(0);
   }

   public Subject(String Code, String Name, int Credit) {
      setSubjectCode(Code);
      setSubjectName(Name);
      setSubjectCredit(Credit);
   }

   public void setSubjectCode(String Code) {
      SubjectCode = Code;
   }

   public void setSubjectName(String Name) {
      SubjectName = Name;
   }

   public void setSubjectCredit(int Credit) {
      SubjectCredit = Credit;
   }

   public String getSubjectCode() {
      return (SubjectCode);
   }

   public String getSubjectName() {
      return(SubjectName);
   }

   public int getSubjectCredit() {
      return(SubjectCredit);
   }
```

```
   public String toString() {
      String str = "";
      str = getSubjectCode()+" "+getSubjectName()+" ";
      str += getSubjectCredit();
      return(str);
   }
}
```

```
// File Name : Student.java

public class Student {
   String StudentCode;
   String StudentName;
   String StudentSurName;

   /** Creates a new instance of Student */
   public Student() {
      setStudentCode("");
      setStudentName("");
      setStudentSurName("");
   }

   public Student(String Code, String Name, String SurName) {
      setStudentCode(Code);
      setStudentName(Name);
      setStudentSurName(SurName);
   }

   public void setStudentCode(String Code) {
      StudentCode = Code;
   }

   public void setStudentName(String Name) {
      StudentName = Name;
   }

   public void setStudentSurName(String SurName) {
      StudentSurName = SurName;
   }

   public String getStudentCode() {
      return(StudentCode);
   }

   public String getStudentName() {
      return(StudentName);
   }

   public String getStudentSurName() {
      return(StudentSurName);
   }
```

```
   public String toString() {
      String str = "";
      str = getStudentCode()+" "+getStudentName()+" ";
      str += getStudentSurName();
      return(str);
   }
}
```

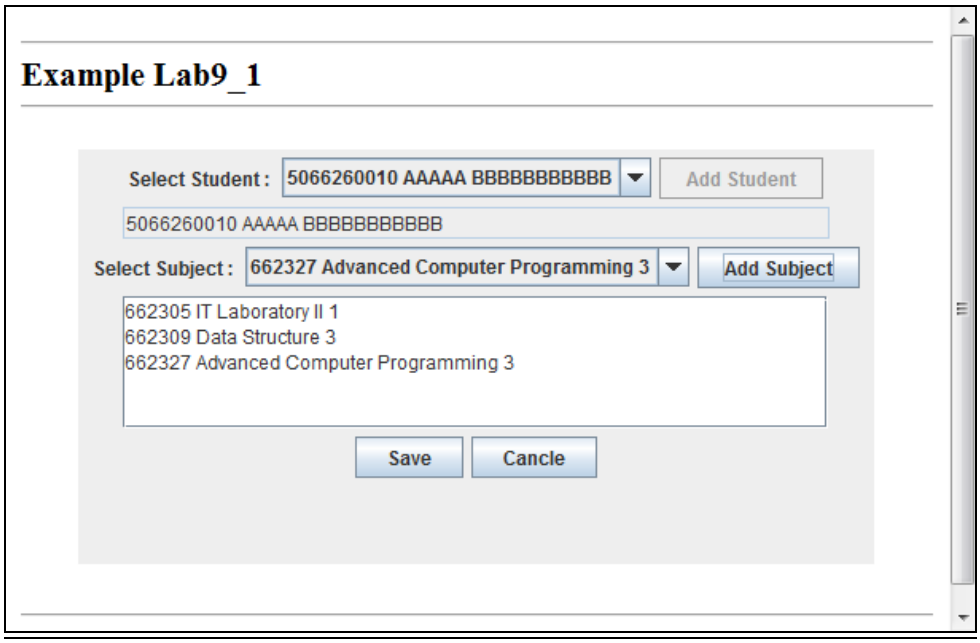
```
// File Name : Register.java

public class Register {
   private Student std;
   private Subject sub[];
   private int max, count = -1;

   /** Creates a new instance of Register */
   public Register() {
      std = new Student();
      max = 0;
   }

   public Register(Student std, int n) {
      this.std = std;
      max = n;
      createSubject(max);
   }

   private void createSubject(int n) {
      sub = new Subject[n];
   }

   public void setStudent(Student std) {
      this.std = std;
   }

   public void setSubject(Subject sub) {
      this.sub[++count] = sub;
   }

   public void setSubject(Subject sub, int n) {
      this.sub[n] = sub;
   }

   public String getStudent() {
      return(std.toString());
   }

   public String getSubject(int n) {
      return(sub[n].toString());
   }
}
```

```
// File Name : Lab9_1.java

import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
public class Lab9_1 extends JApplet implements ActionListener {
   Student std[];
   Subject sub[];
   String studentStr[], subjectStr[];
   Container container;
   JComboBox stdCombo, subCombo;
   JLabel stdLabel, subLabel;
   JButton addstdBtn, addsubBtn, saveBtn, clearBtn, cancleBtn;
   JTextField stdText;
   JTextArea subTextArea;
   JScrollPane subScroll;
   Register reg;
   int count = 0;

   /** Creates a new instance of Lab9_1 */
   public Lab9_1() {
      initStudent();
      initSubject();
      initGui();
      reg = new Register(new Student(), 5);
   }

   public void initStudent() {
      std = new Student[3];
      studentStr = new String[3];
      std[0] = new Student("5066260010","AAAAA","BBBBBBBBBB");
      std[1] = new Student("5066260024","DDDDD","GGGGGGGGG");
      std[2] = new Student("5066260035","HHHHH","KKKKKKKKKK");
      studentStr[0] = std[0].toString();
      studentStr[1] = std[1].toString();
      studentStr[2] = std[2].toString();
   }

   public void initSubject() {
      sub = new Subject[5];
      subjectStr = new String[5];
      sub[0] = new Subject("662305","IT Laboratory II", 1);
      sub[1] = new Subject("662309","Data Structure", 3);
      sub[2] = new Subject("662310","Database System", 3);
      sub[3] = new Subject("662317","Data Communication", 3);
      sub[4] = new Subject("662327",
                        "Advanced Computer Programming", 3);
      subjectStr[0] = sub[0].toString();
      subjectStr[1] = sub[1].toString();
      subjectStr[2] = sub[2].toString();
      subjectStr[3] = sub[3].toString();
      subjectStr[4] = sub[4].toString();
   }
```

```
   public void initGui() {
      container = getContentPane();
      container.setLayout(new FlowLayout());

      stdLabel = new JLabel("Select Student : ");
      container.add(stdLabel);
      stdCombo = new JComboBox( studentStr );
      stdCombo.setMaximumRowCount(3);
      container.add(stdCombo);
      addstdBtn = new JButton("Add Student");
      addstdBtn.addActionListener(this);
      container.add(addstdBtn);
      stdText = new JTextField(40);
      stdText.setEditable(false);
      container.add(stdText);

      subLabel = new JLabel("Select Subject : ");
      container.add(subLabel);
      subCombo = new JComboBox( subjectStr );
      subCombo.setMaximumRowCount(5);
      container.add(subCombo);
      addsubBtn = new JButton("Add Subject");
      addsubBtn.setEnabled(false);
      addsubBtn.addActionListener(this);
      container.add(addsubBtn);
      subTextArea = new JTextArea(5,40);
      subTextArea.setEditable(false);
      subScroll = new JScrollPane(subTextArea);
      container.add(subScroll);

      saveBtn = new JButton(" Save ");
      saveBtn.setEnabled(false);
      saveBtn.addActionListener(this);
      container.add(saveBtn);

      cancleBtn = new JButton(" Cancle ");
      cancleBtn.setEnabled(false);
      cancleBtn.addActionListener(this);
      container.add(cancleBtn);
   }

   public void actionPerformed(ActionEvent event) {
      if (event.getSource() == addstdBtn) {
         int n = stdCombo.getSelectedIndex();
         stdText.setText(std[n].toString());
         reg.setStudent(std[n]);
         addstdBtn.setEnabled(false);
         addsubBtn.setEnabled(true);
         saveBtn.setEnabled(true);
         cancleBtn.setEnabled(true);
      }
      else if (event.getSource() == addsubBtn) {
         int n = subCombo.getSelectedIndex();
         subTextArea.append(sub[n].toString()+"\n");
```

```
            reg.setSubject(sub[n], count);
            count++;
            if (count == 5 ) addsubBtn.setEnabled(false);
         }
         else if (event.getSource() == saveBtn) {
            String output="";
            output = "Student :" + reg.getStudent();
            output +=  "\nSubject:\n";
            for(int n = 0 ; n < count; n++)
               output += reg.getSubject(n) + "\n";
            JOptionPane.showMessageDialog(this, output,
               "Registration Data",JOptionPane.INFORMATION_MESSAGE);
            resetBtn();
         }
         else if (event.getSource() == cancleBtn) {
            stdText.setText("");
            subTextArea.setText("");
            count = 0;
            resetBtn();
         }
      }

      public void resetBtn() {
         addstdBtn.setEnabled(true);
         addsubBtn.setEnabled(false);
         saveBtn.setEnabled(false);
         cancleBtn.setEnabled(false);
         stdText.setText("");
         subTextArea.setText("");
      }

      public void init( ) {
           Lab9_1 lab9_1 = new Lab9_1();
      }
}
```

ผลลัพธ์



การทดลองที่ 9-2

SubjectNew
- SubjectCode : String - SubjectName : String - SubjectCredit : int - static count : int
+ SubjectNew() + SubjectNew(String Code, String Name, int Credit) + SubjectNew(SubjectNew sub) + setSubjectCode(String Code) : void + setSubjectName(String Name) : void + setSubjectCredit(int Credit): void + getSubjectCode() : String + getSubjectName() : String + getSubjectCredit() : int # finalize() : void + static getCount() : int + toString() : String

```
// File Name : SubjectNew.java
public class SubjectNew {
    private String SubjectCode;
    private String SubjectName;
    private int  SubjectCredit;
    private static int count = 0;

    /** Creates a new instance of Subject */
    public SubjectNew() {
        setSubjectCode("");
        setSubjectName("");
        setSubjectCredit(0);
        count++;
    }
```

```
    public SubjectNew(String Code, String Name, int Credit) {
        setSubjectCode(Code);
        setSubjectName(Name);
        setSubjectCredit(Credit);
        count++;
    }

    public SubjectNew( SubjectNew sub) {
        setSubjectCode(sub.getSubjectCode());
        setSubjectName(sub.getSubjectName());
        setSubjectCredit(sub.getSubjectCredit());
        count++;
    }
    public void setSubjectCode(String Code) {
        SubjectCode = Code;
    }

    public void setSubjectName(String Name) {
        SubjectName = Name;
    }

    public void setSubjectCredit(int Credit) {
        SubjectCredit = Credit;
    }

    public String getSubjectCode() {
        return (SubjectCode);
    }

    public String getSubjectName() {
        return(SubjectName);
    }

    public int getSubjectCredit() {
        return(SubjectCredit);
    }

    protected void finalize() {
        count--;
    }

    public static int getCount() {
        return(count);
    }

    public String toString() {
        String str = "";
        str = getSubjectCode()+" "+getSubjectName()+" ";
        str += getSubjectCredit();
        return(str);
    }
}
```

```
// File Name : Lab9_2.java

import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
public class Lab9_2 extends JApplet implements ActionListener {
   SubjectNew sub[];
   Container container;
   JComboBox stdCombo, subCombo;
   JLabel codeLabel, nameLabel,creditLabel;
   JButton addBtn, editBtn, deleteBtn, showBtn, clearBtn;
   JTextField codeText, nameText, creditText, statusText;
   JTextArea subTextArea;
   JScrollPane subScroll;

   /** Creates a new instance of Lab9_2 */
   public Lab9_2() {
      initGui();
      sub = new SubjectNew[10];
      statusText.setText("Number Object : "+ SubjectNew.getCount());
   }

   public Lab9_2(int max) {
      initGui();
      sub = new SubjectNew[max];
      statusText.setText("Number Object : "+ SubjectNew.getCount());
   }

   public void initGui() {
      container = getContentPane();
      container.setLayout(new FlowLayout());

      codeLabel = new JLabel(" Subject Code : ");
      container.add(codeLabel);
      codeText = new JTextField(10);
      container.add(codeText);
      container.add(new JLabel("                                        "));

      nameLabel = new JLabel(" Subject Name : ");
      container.add(nameLabel);
      nameText = new JTextField(20);
      container.add(nameText);

      creditLabel = new JLabel("Subject Credit : ");
      container.add(creditLabel);
      creditText = new JTextField(5);
      container.add(creditText);
      container.add(new JLabel("                                        "));

      addBtn = new JButton("Add");
      addBtn.addActionListener(this);
      container.add(addBtn);

      editBtn = new JButton("Edit");
      editBtn.addActionListener(this);
      container.add(editBtn);
```

```
      deleteBtn = new JButton("Delete");
      deleteBtn.addActionListener(this);
      container.add(deleteBtn);

      showBtn = new JButton("Show");
      showBtn.addActionListener(this);
      container.add(showBtn);

      clearBtn = new JButton("Clear");
      clearBtn.addActionListener(this);
      container.add(clearBtn);
      subTextArea = new JTextArea(8,25);
      subTextArea.setEditable(false);
      subScroll = new JScrollPane(subTextArea);
      container.add(subScroll);

      statusText = new JTextField(30);
      statusText.setEnabled(false);
      container.add(statusText);
   }

   public void actionPerformed(ActionEvent event) {
      if (event.getSource() == addBtn) {
         if (SubjectNew.getCount() == sub.length)
         {
            JOptionPane.showMessageDialog( this,
               "Array full , can not add",
                        "Message", JOptionPane.INFORMATION_MESSAGE);
            return;
         }
         int pos = CheckArrayEmpty();
         int n = Integer.parseInt(creditText.getText());
         sub[ pos ] = new SubjectNew( codeText.getText(),
                                 nameText.getText(), n);
         subTextArea.setText( readString( sub ) );
         JOptionPane.showMessageDialog(this, "Add Subject already",
                        "Message", JOptionPane.INFORMATION_MESSAGE);
         clearTextField();
      }
      else if (event.getSource() == editBtn) {
         String s = codeText.getText();
         int n = searchSubject( sub, s);
         if (n >= 0  ) {
            sub[n].setSubjectName(nameText.getText());
            sub[n].setSubjectCredit( Integer.parseInt(
                        creditText.getText() ) );
            subTextArea.setText( readString(sub) );
            JOptionPane.showMessageDialog(this,
                  "Edit Subject already",
                 "Message", JOptionPane.INFORMATION_MESSAGE);
            clearTextField();
         }
         else {
            JOptionPane.showMessageDialog(this,
                  "can not found subject code",
                  "Error Message", JOptionPane.ERROR_MESSAGE);
```

```
        }
      }
      else if (event.getSource() == deleteBtn) {
         String s = codeText.getText();
         int n = searchSubject(sub, s);
         if (n >= 0  ) {
            nameText.setText( sub[n].getSubjectName() );
            creditText.setText( sub[n].getSubjectCredit() + "" );
            int ans = JOptionPane.showConfirmDialog(this,
                "Delete subject ",
                 "Confirm", JOptionPane.YES_NO_OPTION);
            // 0 - Yes, 1 - No
            if (ans == 0) {
               sub[n] = null;
               System.gc();
               subTextArea.setText( readString(sub) );
            }
            clearTextField();
         }
         else {
            JOptionPane.showMessageDialog(this,
                  "can not found subject code",
                   "Error Message", JOptionPane.ERROR_MESSAGE);
         }
      }
      else if (event.getSource() == showBtn) {
         String s = codeText.getText();
         int n = searchSubject(sub, s);
         if (n >= 0  ) {
            nameText.setText( sub[n].getSubjectName() );
            creditText.setText( sub[n].getSubjectCredit() + "" );
         }
         else {
            JOptionPane.showMessageDialog(this,
               "can not found subject code",
               "Error Message", JOptionPane.ERROR_MESSAGE);
         }
      }
      else if (event.getSource() == clearBtn) {
         clearTextField();
      }
      statusText.setText("Number Object : "+ SubjectNew.getCount());
   }

   public int CheckArrayEmpty() {
      for(int n = 0 ; n < sub.length ; n++)
         if (sub[n] == null)  return( n );
      return( -1 );
   }

   public void clearTextField() {
      codeText.setText("");
      nameText.setText("");
      creditText.setText("");
   }
```

```
   public int searchSubject(SubjectNew sub[], String s) {
      for(int n= 0 ; n < sub.length ; n++) {
         if ( sub[n] != null )
            if ( s.equals(sub[n].getSubjectCode()) )
               return(n);
      }
      return(-1);
   }

   public String readString(SubjectNew sub[]) {
      String str="";
      for(int n = 0 ; n < sub.length ; n++) {
         if (sub[n] != null)
            str += sub[n].toString() + "\n";
      }
      return(str);
   }

   public void init( ) {
        Lab9_2 lab9_2 = new Lab9_2(15);
    }

}
```

ผลลัพธ์