**实验4 继承与多态**

**一. 实验目的及实验环境**

1理解子类、父类的概念，掌握子类继承父类的方法。

2理解成员变量的隐藏和方法重写。

3会使用super关键字操作被隐藏的成员变量和方法。

4了解final类和final方法的作用。

5理解protected修饰符的作用和用法。

**二. 实验内容**

1 基本内容（实验前请及时熟悉如下相关内容）

1）类的继承：定义子类

2）使用super关键字调用父类方法

3）方法覆盖overriding：覆盖Object类的toString( )方法

4）练习使用ArrayList类的方法

5）练习覆盖Object类的equals( )方法

**2 综合实验：**

**2.1 朱晓龙2011《Java语言程序设计》P144: 3.** 设计一个学生类Student，其属性有姓名、年龄和学位。从Student类继承产生本科生类和研究生类，本科生增加专业属性，研究生增加研究方向属性。每个类都有显示方法，用于输出属性信息。

**2.2 (Y. Daniel Liang英文版八版P403：11.1)** (The Triangle class) Design a class named Triangle that extends GeometricObject. The class contains:

■ Three double data fields named side1, side2, and side3 with default values 1.0 to denote three sides of the triangle.

■ A no-arg constructor that creates a default triangle.

■ A constructor that creates a triangle with the specified side1, side2, and side3.

■ The accessor methods for all three data fields.

■ A method named getArea() that returns the area of this triangle.

■ A method named getPerimeter() that returns the perimeter of this triangle.

■ A method named toString() that returns a string description for the triangle.

For the formula to compute the area of a triangle, see Exercise 2.21. The toString() method is implemented as follows:

return "Triangle: side1 = " + side1 + " side2 = " + side2 + " side3 = " + side3;

Draw the UML diagram for the classes Triangle and GeometricObject.

Implement the class. Write a test program that creates a Triangle object with sides 1, 1.5, 1, color yellow and filled true, and displays the area, perimeter, color, and whether filled or not. （不要求画出UML图）

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**2.3** **(Y. Daniel Liang英文版八版P403：11.2)** (The Person, Student, Employee, Faculty, and Staff classes) Design a class named Person and its two subclasses named Student and Employee.

Make Faculty and Staff subclasses of Employee. A person has a name, address, phone number, and email address. A student has a class status (freshman, sophomore, junior, or senior). Define the status as a constant. An employee has an office, salary, and date hired. Define a class named MyDate that contains the fields year, month, and day. A faculty member has office hours and a rank. A staff member has a title. Override the toString method in each class to display the class name and the person’s name.

Draw the UML diagram for the classes. Implement the classes. Write a test program

that creates a Person, Student, Employee, Faculty, and Staff, and invokes their toString() methods. （不要求画出UML图）

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**2.4 (Y. Daniel Liang英文版八版P404：11.5)** (The Course class) Rewrite the Course class in Listing 10.6. Use an ArrayList to replace an array to store students. You should not change the original contract of the Course class (i.e., the definition of the constructors and methods should not be changed).



**2.5 附加题（供学有余力同学完成，平时成绩有加分！☻）**

(**Y. Daniel Liang英文版八版P404：11.6**) (Using ArrayList) Write a program that creates an ArrayList and adds a Loan object, a Date object, a string, a JFrame object, and a Circle object to the list, and use a loop to display all the elements in the list by invoking the object’s toString() method.



**2.6 附加题（供学有余力同学完成，平时成绩有加分！☻）**

(**Y. Daniel Liang英文版八版P404：11.** **.8\*\***) (New Account class) An Account class was specified in Exercise 8.7. Design a new Account class as follows:

■ Add a new data field name of the String type to store the name of the customer.

■ Add a new constructor that constructs an account with the specified name, id, and balance.

■ Add a new data field named transactions whose type is ArrayList that stores the transaction for the accounts. Each transaction is an instance of the Transaction class. The Transaction class is defined as shown in Figure 11.7.

■ Modify the withdraw and deposit methods to add a transaction to the transactions array list.

■ All other properties and methods are same as in Exercise 8.7.

Write a test program that creates an Account with annual interest rate 1.5%, balance 1000, id 1122, and name George. Deposit $30, $40, $50 to the account and withdraw $5, $4, $2 from the account. Print an account summary that shows account holder name, interest rate, balance, and all transactions.



