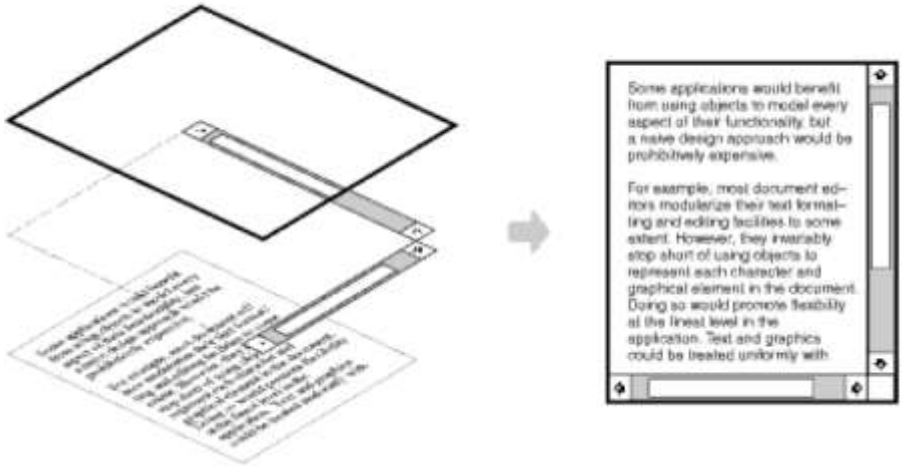
# Projects

## General considerations

1- Project responsibility is collective ownership.
2- The project score is out of 15.
3- Maximum number of students is 4.
4- Implement the program using Java language.
5- Add suitable comments to your source code.
6- Design principles must be applied as much as you can.
7- Pay careful attention to the arrowhead lines.
8- Feel free to add any class, interface, attribute, or method that illustrates the function of the system or application.
9- You are required to explain your code.
**10- Deadline is week 12.**
11- Cheating is not allowed and could lead you to get 0.
12- Deliverables are: softcopy, presentation using power point, full implementation to the system using Java.

## Project 1




Consider a “TextView” object that displays text in a window. “TextView” is empty by default. Suppose that “TextView” should have the ability to add “HorizontalScrollBar” and “VerticalScrollBar” dynamically. Both “HorizontalScrollBar” and “VerticalScrollBar” have the attribute “scrollPosition”.

1- What design pattern should be used?
2- Draw the class diagram for this application.

3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. Drawing objects should be represented by printouts.
4- If we want to add a capability of adding “Border” with attributes “borderColor” and “borderWidth” dynamically to “TextView”, modify the class diagram and the Java code accordingly.

## Project 2

Consider a payment system used for either online and offline shopping. The buyers are classified into two classes “SingleOnlineBuyers” who pay by VISA, “SingleOfflineBuyers” who pay by cash. Each buyer should have a “description” attribute that describes the buyer class.

1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. Buyer description and payment method should be represented by printouts.
4- If the store wants to add a new class of buyers, the “GroupBuyers” who pay by cheque, modify the class diagram and the Java code accordingly.

## Project 3

Assume that we need to design an application with an “IDGeneratorMachine” object which is responsible to assign IDs for students in the university, in a single-threading environment. If the machine is instantiated twice then it is possible to have 2 overlapping ids for 2 different objects, therefore only one instance of “IDGeneratorMachine” object should be instantiated.

1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. The check of creating only one object should be represented by printouts.
4- If the application is modified to work in multithreading environment rather than single-threading environment, what modifications should be applied to the Java code?

## Project 4

Consider an application for a news agency that gathers news and publishes them to different subscribers. The “BussinessPublisher” should be able to inform immediately, when event occurs, its subscribers about the event.

The subscribers can receive the news in either Emails (“EmailSubscriber”) or SMS (“SMSSubscriber”). The solution need to be extensively enough to support new types of subscribers (as new communication technologies may appear).

1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. Receiving the news in either Emails or SMS (“SMSSubscriber”) should be represented by printouts.
4- If the publisher wants to add a new class of subscribers, the “NewSubscriber” who receive news using new communication technology, modify the class diagram and the Java code accordingly.

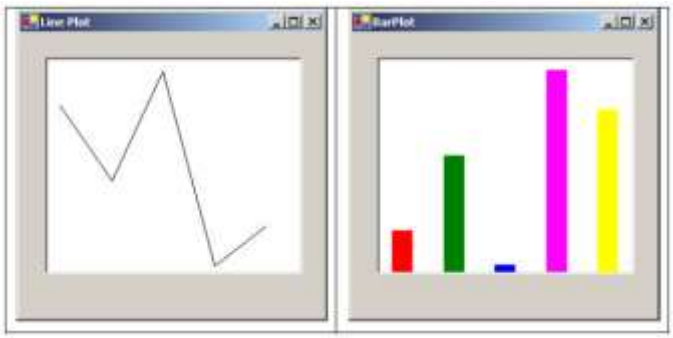
## Project 5

Consider an application used to simulate robots interaction. The application has two robots “Robot1” and “Robot2”. “Robot1” has an aggressive behavior and attacks any other robot found. “Robot2” has a scaring behavior and run away in the opposite direction when it encounters another robot. To decide the action each robot should have the Boolean attribute “OtherRobotFound” which is set by robot sensors. Note that, at some point the robot behavior may change.

1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. The robot name and behavior should be represented by printouts.
4- If another robot, “Robot3”, is added to the application where “Robot3” is staying calm and just ignore any other robot. What modifications should be applied to the class diagram and the Java code accordingly?

## Project 6

Consider an application that implements a simplified graphing program that can present data as a line graph or a bar chart as shown below.



1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. The graph type should be represented by printouts.
4- If you are asked to add another graph type, “pie chart”, what modifications should be applied to the class diagram and the Java code accordingly?

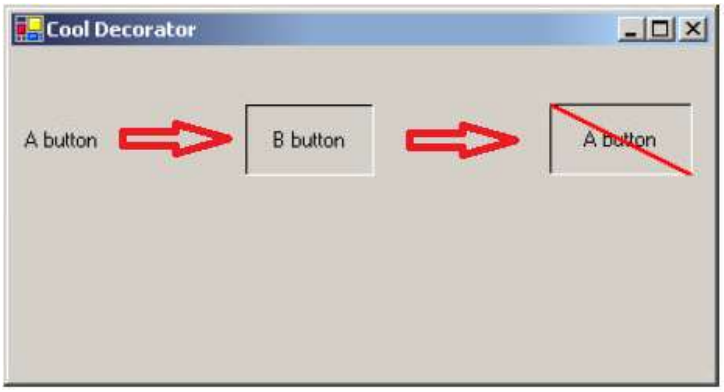
## Project 7

A spooler is a computer utility that regulates data flow by receiving data (as from a word processor), queuing the data in a buffer, and then transmitting it (as to a printer) with increased efficiency. Note that, only one spooler object should be created so that one object is responsible for data flow regulation.

1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. The check of creating only one spooler should be represented by printouts.
4- If the application is modified to work in multithreading environment rather than single-threading environment, what modifications should be applied to the Java code?

## Project 8

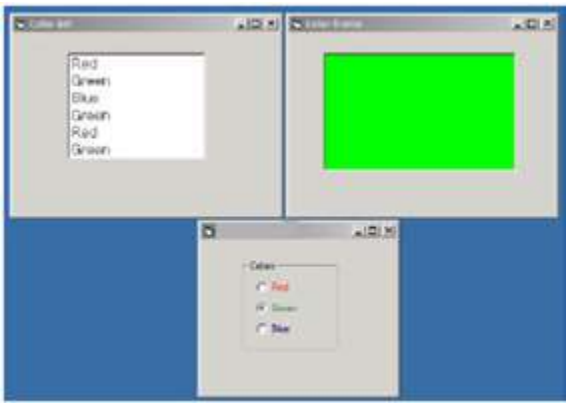
Recent Windows applications such as Internet Explorer and Netscape Navigator have a row of flat, unbordered buttons that highlight themselves with outline borders when you move your mouse over them. Some Windows programmers call this toolbar a CoolBar and the buttons CoolButtons. Design a coolButton that may be highlighted or slashed dynamically as shown below.




1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. The highlight and slashed action should be represented by printouts.
4- If we want to add a disabled action dynamically to the CoolButton, modify the class diagram and the Java code accordingly?

## Project 9

You are asked to design an application that has a data control panel. This control panel generates data that is displayed simultaneously as a colored panel and as a list box (as shown below). The decision whether these displays are affected or not may be changed at runtime (for example, at runtime, I can choose whether both displays are affected).



1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the application. The main program should involve a code to test all program functionality. Receiving the data should be represented by printouts.

4- If a textbox display is added which display the received data in the textbox, modify the class diagram and the Java code accordingly.

## Project 10

Consider an application where you should simulate the behavior of a policeman when a car driver breaks the speed limit. There are two types of policemen, nice policeman, and hard policeman. The nice policeman stops the car driver, gives him some instructions, and smile to him then lets him go. The hard policeman stops the car driver, shouts at him, then gives him a ticket. Both the two policemen should be implemented as two classes with a method “ProcessSpeed”.

1- What design pattern should be used?
2- Draw the class diagram for this application.
3- Write a java code to fully implement all classes of the system. The main program should involve a code to test all program functionality. The behavior of the policeman should be represented by printouts. This behavior may be changed at runtime (for example, the nice policeman may behave as the hard policeman and vice versa).
4- If it is required to add a third type of policemen who stops the car driver, and gives him warning, modify the class diagram and the Java code accordingly.