



The University of the West Indies, St. Augustine  
COMP 3607 Object Oriented Programming II  
2020/2021 Semester 1  
Lab Tutorial - Week 7

This tutorial focuses on design patterns and code refactoring.

Learning Objectives:

- Write code to implement the following design pattern:
  - **Observer**
  - Refactor code to implement a particular design pattern.

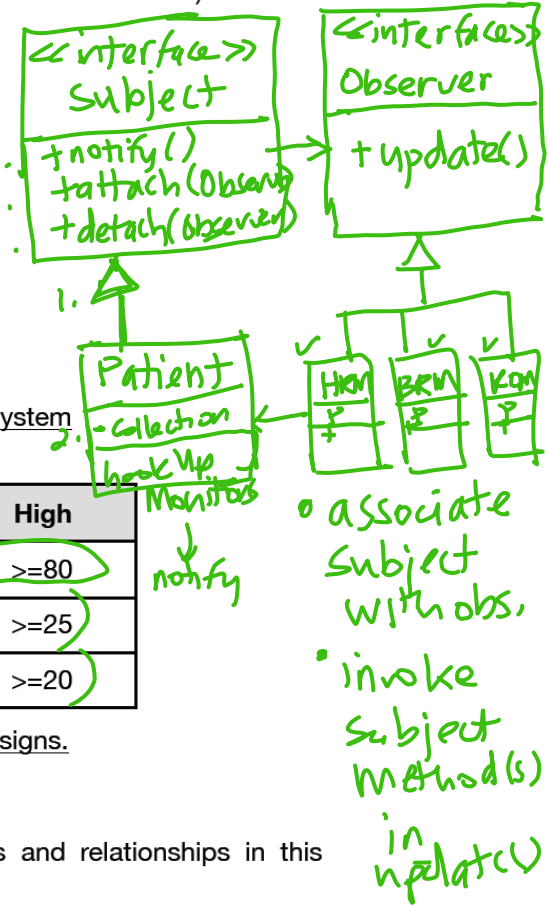
1. A patient's vital signs are being monitored based on heart rate, breathing rate and kidney output. The system outputs a patient's statistics as shown in Figure 1 (see video for more detail) based on the ranges of values in Table 1.

```
Output - lab7 (run) Lab7.java patientStats.txt
run:
Heart Rate: 95 beats per min High
Breathing Rate: 30 breaths per min: High
Kidney Output: 0 ml per min: Low
Heart Rate: 98 beats per min High
Breathing Rate: 25 breaths per min: High
Kidney Output: 0 ml per min: Low
Heart Rate: 100 beats per min High
Breathing Rate: 20 breaths per min: Normal
Kidney Output: 0 ml per min: Low
Heart Rate: 110 beats per min High
Breathing Rate: 33 breaths per min: High
Kidney Output: 0 ml per min: Low
```

Figure 1. Sample output produced by the monitoring system

	Low	High
Heart Rate (beats per min)	≤60	≥80
Breathing Rate (breaths per min)	≤12	≥25
Kidney Output (ml per min)	≤10	≥20

Table 1. Range of high and low values for patient vital signs.



- Using the Observer design pattern:
- (a) Draw a UML class diagram to model the classes, interfaces and relationships in this scenario.
  - (b) Refactor the Patient.java class and write additional code to implement the classes in the monitoring system.