# COEN 160 OO Analysis, Design and Programming Winter2017

**Project (Groups of two)**

**Total points (250) with an EC of up to 50pts**

*EcoRe* is a company that wants to promote and market products for **recycling** of material.

The company wants to design and manufacture, an *EcoRecycle* system, consisting of **recycling machines** and **recycling stations** which monitor the recycling machines.

You are required to help *EcoRe* design and implement the Recycling machines and Recycling Stations. As a part of that requirement, **you are given the job of creating a simulation of how the Recycling machines and Stations typically work where they are installed.**

Given below is the description of the functionality of the different components in this system.

**1.0 A Recycling machine (RCM)** is similar to a vending machine and is designed to accept recyclable items that are aluminum and glass products where a user is paid a small amount of money for each type of item. The recycling machine is equipped with an interface to display the items accepted by the machine, the amount paid for each item and slot(s) to accept the items and return the money to the user. These machines are installed in offices, schools, hospitals and large buildings.

Each Recycling Machine has a machine id, location, a list of items that it can accept, price paid for each item, capacity (in weight) and the total weight of items currently in the machine.

**1.1 A Recycling Monitoring Station (RMOS)** is a software program that runs on a workstation that is connected to monitor typically ten different recycling machines within a radius of one mile. It is used to activate each recycling machine in the group (it monitors) to accept items; and RMOS keeps track of the status of each individual recycling machine. The status includes the current weight of recycled items in the machine and amount of money in the machine. RMOS updates the capabilities of the RCMs – this may include changing or adding new types of recyclable items and changing the price for each item. RMOS collects statistical information about usage of the RCMs it monitors. This may include the no. of times the machine was emptied in a specific duration (in no. of hours), weight of items collected in a specific duration, no. of items collected by type (aluminum, glass and so on).

**You are required to design and implement a simulation of a group of Recycling machines and a recycling Station that monitors them, using OO analysis and design techniques and implementation in Java.**

## 2.0 Your simulation should demonstrate the following:

Provide at least two Recycling machines (RCM) and one Recycling Monitoring Station (RMOS) with Graphical User Interfaces and functionality as described below.

## 2.1 The RCM

An RCM is allows users to recycle items. An RCM is represented by GUI components (like panels, buttons, menus text boxes etc of your choice). Each machine is identified by its location and an id. Each machine should store the time of the last removal of its recycled items.

## Display and functionality of the RCM

- Each RCM **displays** its location, id, types of items it accepts and the money returned for each item. **Note**: Each RCM when created starts with no items in it and a specific amount of money (for example, $100).
- **Recycling an item:** The RCM GUI allows a user to drop an item to be recycled in the designated receptacle. The user interface shows the type of item, weight of item and money given to the user. The amount of money in the machine is adjusted after the price of the recycled item is given to the user. If there is no money in the machine, a coupon is given to the user (the coupon is redeemable in the designated stores). The total weight of the items in the machine is adjusted. **Note**: As a developer, choose and set a price for each of the item types, by their weight. For example, $1.00 for 2lbs of glass.
- When the user has many items to recycle, he/she may indicate the start of the session (with a button click, for example, drop the items and indicate the end of a session (with a button click, for example). Money/coupon will be returned for the value of all items returned within that session.
- RCM does not allow an item if it is full (capacity to hold the items has been reached).
- **Emptying the RCM**: RCM allows an automatic (not through the GUI) emptying of the machine when the command is issued by its monitoring station (RMOS).
- **Stocking money in the RCM**: RCM allows an automatic (not through the GUI) restocking of the machine with money (same fixed amount every time) when the command is issued by its monitoring station (RMOS).

## 2.2 The RMOS

An RMOS allows administrators to monitor a group of Recycling Monitoring Stations (RMOS). Please note that each RMOS monitors a group of RCMs (in your demo, you should have at least 2 RCMS in the group). In the discussion below, we will refer to this group as RCM group.

An RMOS is represented by GUI components (of your choice) to enable an administrator to do the following:

- Allow the user to log in with a user name. Change/add new types of recyclable items.
- Change the price of an item.
- Check and display the amount of money in a specific RCM.
- Check and display the current (and available) capacity (by weight or volume) of an RCM. This indicates whether an RCM is full and needs to be emptied.
- **Extra points**: The admin may choose to display the weight in Metric units.
- Get number of items returned by a specific machine (or all the machines in the group) in a month (for your demo, you can set this duration to be a few minutes).
- Show the time a specific RCM was emptied last time.
- Get the location of recycling station and id of the machine that was used the most.
- Display the usage statistics for each RCM in the RCM group. This will include the total weight of recycled items by machine (per day, week ..), total value (cash or coupons) issued, using a visualization (a graph for example); show the number of times a particular RCM was emptied in a specific duration.

**Note:**

You are free to add any enhancements (and make reasonable assumptions) of your choice to the system described above.

An extra credit of up to 50 pts is possible for creativity and usability of the system.

**Design and implement (in Java) the *EcoRecycle* system for *EcoRe* using OO analysis and Design Techniques and Java.**

# Deliverables:

Part 1: The Analysis and Design documents (100 pts)

The Analysis and Design document should include the following:

1. Use-Cases to illustrate the functionality of the system (20 pts) (**Deliverable 1**)

2. CRC cards to show a list of the most important classes and a brief description of their responsibilities. (15 pts) (Deliverable 1)

3. Class Diagrams. (25 pts) (Deliverable 2)

4. State Transitions (if any) and Interaction Diagrams for the Usage scenarios. (25

pts) (Deliverable 2)

5. The Logical partitioning of the system into packages (15 pts) (Deliverable 2)

NOTE: UML notation is to be used.

**Part 2 (Demos will be during the 10th week) (150 pts)**

An implementation with a final demo of the project is required. (100 pts) (Deliverable 2)

Source Code (Java) (50 pts) (Deliverable 2)

**Due Dates**

Deliverable 1: 28 Feb

Deliverable 2: Week 10