Homework: Defining Classes

This document defines the homework assignments from the ["OOP" Course @ Software University](). Please submit as homework a single **`zip`** / **`rar`** / **`7z`** archive holding the solutions (source code) of all below described problems. The solutions should be written in C#.

Problem 1. Persons

Define a class **Person** that has **name**, **age** and **email**. The **name** and **age** are mandatory. The **email** is optional. Define **properties** that accept non-empty name and age in the range [1...100]. In case of invalid argument, throw an exception. Define a property for the email that accepts either **null** or non-empty string containing '**@**'. Define two **constructors**. The first constructor should take name, age and email. The second constructor should take name and age only and call the first constructor. Implement the **ToString()** method to enable printing persons at the console.

Problem 2. Laptop Shop

Define a class **Laptop** that holds the following information about a laptop device: **model**, **manufacturer**, **processor**, **RAM**, **graphics card**, **HDD**, **screen**, **battery**, **battery life** in hours and **price**.

- The **model** and **price** are mandatory. All other values are optional.
- Define two separate classes: a class **Laptop** holding an instance of class **Battery**.
- Define several constructors that take different sets of arguments (full laptop + battery information or only part of it). Use proper variable types.
- Add a method in the **Laptop** class that displays information about the given instance
    - Tip: override the **ToString()** method
- Put **validation** in all property setters and constructors. String values cannot be empty, and numeric data cannot be negative. Throw exceptions when improper data is entered.

Sample laptop description (full):	
model	Lenovo Yoga 2 Pro
manufacturer	Lenovo
processor	Intel Core i5-4210U (2-core, 1.70 - 2.70 GHz, 3MB cache)
RAM	8 GB
graphics card	Intel HD Graphics 4400
HDD	128GB SSD
screen	13.3" (33.78 cm) – 3200 x 1800 (QHD+), IPS sensor display
battery	Li-Ion, 4-cells, 2550 mAh
battery life	4.5 hours
price	2259.00 lv.

Sample laptop description (mandatory properties only)	
model	HP 250 G2
price	699.00 lv.

Problem 3. PC Catalog

Define a class **Computer** that holds **name**, **several components** and **price**. The components (processor, graphics card, motherboard, etc.) should be objects of class **Component**, which holds **name**, **details** (optional) and **price**.

- Define several constructors that take different sets of arguments. Use proper variable types. Use properties to validate the data. Throw exceptions when improper data is entered.

- Add a method in the Computer class that displays the **name**, each of **the components' name** and **price** and the **total computer price**. The total price is the **sum of all components' price**. Print the prices in BGN currency format.
- Create several Computer objects, **sort them by price**, and print them on the console using the created display method.

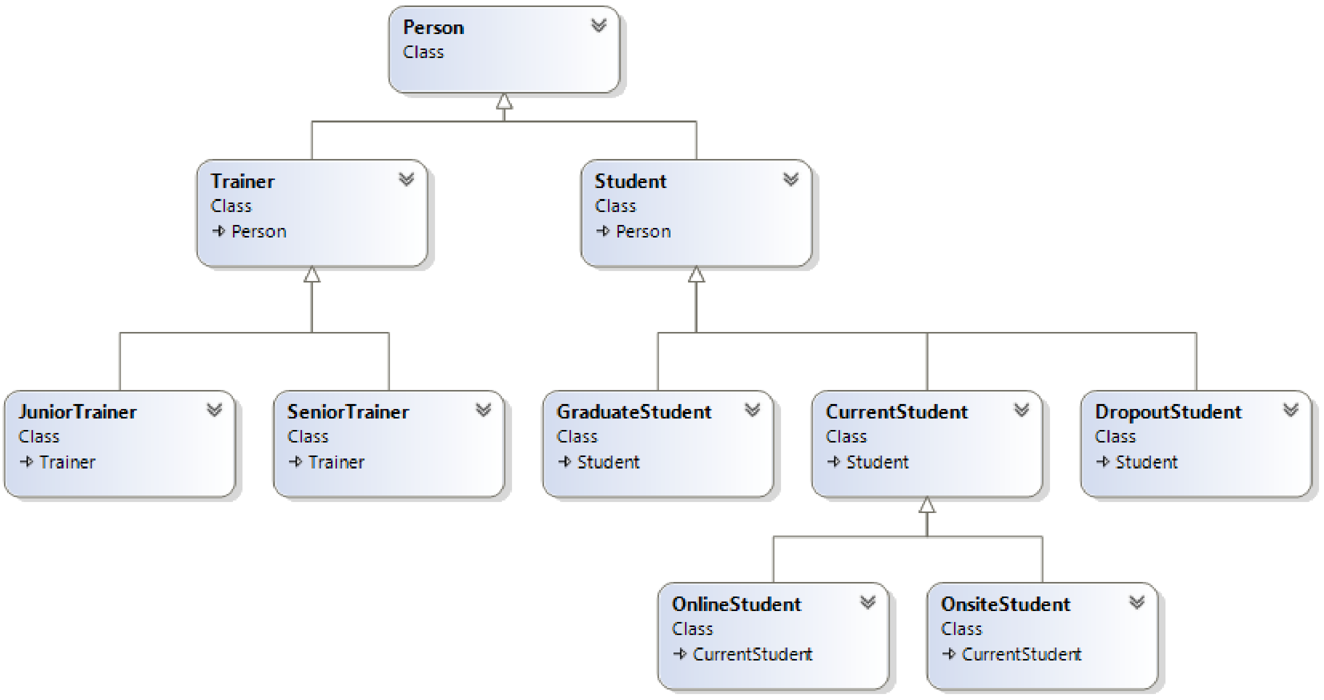
Problem 4. ** Software University Learning System

Define a class **Person** and the classes **Trainer**, **Student**. There are two types of trainers – **Junior** and **Senior Trainer**. There are three types of Students – **Graduate**, **Current** and **Dropout Student**. There are two types of Current Students – **Online** and **Onsite Student**. Implement the given structure below. **A class down in the hierarchy should implement the fields, properties and methods of the classes above it.** (Tip: Use **Inheritance** to achieve code reusability). The classes should implement the following fields/methods:

- **Person** – fields **first name**, **last name**, **age**
  - **Trainer** – method **CreateCourse([courseName])** that prints that the course has been created
    - **Senior Trainer** – method **DeleteCourse([courseName])** that prints that the course has been deleted
  - **Student** – fields **student number**, **average grade**
    - **Current Student** – field **current course**
      - **Onsite Student** – field **number of visits**
    - **Dropout Student** – field **dropout reason**, method **Reapply()** that prints all information about the student and the dropout reason

Write a class **SULSTest** that tests the implemented class structure. Create a **list of objects from each class**. Extract only the **Current Students**, **sort them by average grade** and **print information** about each one on the console.

Tip: Use the LINQ extension methods **Where()** and **OrderBy()** with lambda expressions.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