## Lesson 2: Object oriented analysis and design

### 2.1. Introduction

In this lesson, you will learn about object oriented analysis and design.

### 2.2. Lesson objectives

By the end of this lesson, you will be able to

### 2.3. Lesson outline

This lesson is structured as follows:



### 2.3. Object oriented and analysis concepts

[a]. **Object oriented analysis and design:** This is a system analysis and design methodology which supports bottom-up and top-down approaches (functional decompositions).Can also be defined as a software engineering approach that models a system as a group of interacting objects.

[b]. **Object oriented analysis**: This is a method of analysis in which system requirements are identified in terms of objects and their interactions.

[c]. **Object oriented design**: A method of realizing system requirements in terms of classes, class hierarchies and their interrelationship.

[d]. **Object Orientation:** This is about viewing and modeling the world/system as a set of interacting and interrelated objects.

[e]. **Class:** Can be defined as template for creating objects. Refer to collection of objects with similar characteristics. In a scenario, a class is modeled as a noun. Example employee, student, book, lecturer etc.

[f]. **Object:** This is an instance of a class. Examples of objects in class employee can be Jane, john etc.

[g]. **Class diagram:** In modelling a class is represented as a rectangle with three compartments.

### 2.4. Object oriented analysis and design

Object oriented analysis can be defined as investigation and to be more specific it is the investigation of object. Object oriented design means

collaboration of identified object. It is important to understand the object oriented analysis and design concepts. Now the most important purpose of object oriented analysis is to identify object of a system to be designed. This analysis is also done for an existing system. Now an efficient analysis is only possible when we are able to start thinking in a way where objects can be identified. After identifying the objects their relationships are identified and finally the design is produced.

So the purpose of object oriented analysis and design can describe as:

- Identifying the object of a system.
- Identify their relationships.
- Make a design which can be converted to executables using OO languages. There are three basic steps where the OO concepts are applied and implemented. The steps can be defined as:
  - Object oriented analysis
  - Object oriented design
  - Object oriented implementation using object oriented languages Now the above three points can be described in details:

### 2.5. Object oriented analysis

During object oriented analysis the most important purpose is to identify objects and describing them in a proper way. If these objects are identified efficiently then the next job of design is easy. The objects should be identified with attributes and functions (methods). Each and every object has some type of responsibilities/methods to be performed. When these responsibilities are collaborated the purpose of the system is fulfilled.

### 2.6. Object oriented design

The second phase is object oriented design. During this phase emphasis is given upon the requirements and their fulfillment. In this stage the objects are collaborated according to their intended association. After the association is complete the design is also complete.

### 2.7. Object oriented implementation

The third phase is object oriented implementation. In this phase the design is implemented using object oriented languages like Java, C++, and Visual Basic.NET etc.

**Example**

In a library management system, a borrower can borrow one or several books. However, a book can only be issued to one and only one borrower. A book is describe by bookNo and BookTitle while the borrower is identified by BorrowerID and BorrowerName.Operations to be performed on the book are adding a book and search the book while operations on the borrower will be getting borrower information and displaying borrower information. **Object oriented analysis**

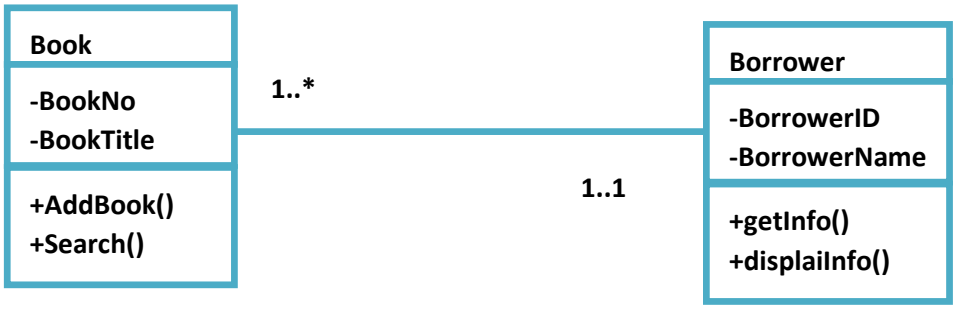
 **Object:** Book

- **Data**: BookNo and BookTitle
- **Operations**: AddBook and Search
- **Object:** Borrower
- **Data**: BorrowerID and BorrowerName
- **Operations:** getInfo and displayInfo

**Object oriented design**

Produce the design.

- For each attribute, determine the data type, length (optional) and visibility.
- For each method, determine the name, argument (optional) and visibility.
- Determine the associations between the classes.
- The visibilities are private (-), public(+) and protected(#).




### 2.8. Object oriented implementation

Using c++ we declare the class. The class will be used to create the objects. The syntax is as follows:

```
Class class_name
{
Access
specifier(visibility):
Data member(s);
Member function(s);
};
```

The details of implementations will follow in the lesson 8.

### 2.9. Revision questions

[a]. Define the following terminologies as used object oriented analysis and design i. Object

ii. Object oriented analysis

iii. Object oriented design

[b]. Differentiate between top down and bottom up approaches in system design [c]. Explain the process of object oriented analysis and design

## 2.10. Summary

In this lesson, you have learnt about object oriented analysis and design; the phases involved in object oriented analysis and design- object analysis, object oriented design and object oriented implementation.

## 2.11. Suggested reading

[1]. Object oriented programming with C++ by E Balagurusamy 3rd ed; publisher: Tata Mcraw Hill

[2]. Sams teach yourself c++ in 24 hours by Jesse Liberty and Rogers Cadenhead. [3]. Object oriented programming in c++ by Joyce Farrel [4]. Object-oriented programming with c++ by Sourav Sahay.