Study Plan for Module #3

Introduction to Object-oriented Programming 7.5 HEC

Contents

There is quite a lot to read in this document, but if you consider how much is being *said* during a campus course held at the university it is relatively little.

Introduction

Who is responsible for which module?

- Module #1: Hans Jernberg, hje@du.se
- Module #2: Roger Nyberg, rny@du.se (also Course Manager)
- Module #3: Hans Jernberg, hje@du.se

Exercises without solutions

So why are there no solutions given!?
As always with a ready-made templates / solutions, there is a chance that this is interpreted as the only way to solve the problem. Avoid seeing things as "Black or White", "True and false." In terms of language syntax this is true, but not the logic of your program, i.e, the semantics – There are often several solutions to one and the same problem!

We encourage you to think freely and look for solutions yourself through books (the course literature in first hand), the Internet, the forum (in Learn) and **of course** you can contact us (the lecturers). In order to get an easier start in searching the Internet a collection of links are provided (see course website).

Discussion is a great source of learning new things!! Take advantage of the forum (in Learn) and discuss what your problem, and help other students with their problems. Describing a problem so that someone else understands it calls for reflection. Likewise to explain a probable solution to a problem for someone else will enforce learning.
- Sure, it takes longer to find the answers yourself than looking at the solutions appendix "in the back of the book", but we assure that your learning will be significantly better and you will remember what you have learned a longer time.

Your Questions and How to contact the lecturer

Although this is a distance learning course, you can / should naturally ask questions if you do not understand some parts. Please do it this order:

1. **State your question in the Forum** found at the left hand side on the course home page in Learn. This way other students can see your question (and yes they probably have the same questions as you!) and those students who have an answer will state a likely solution.
2. If no answer is obtained through the forum, then you are welcome **to send an email** to us.

We look forward to this interaction! ☺

Module #3

Review the goals and the content for this module in the course syllabus

More precisely you are expected to **apply knowledge** and **skills** in order to:

Chapter *"Arrays and the ArrayList class"*

- ☐ According to module #2
- ☐ Use search and sorting algorithms.
- ☐ Use multi dimensional arrays.
- ☐ Use instances of the ArrayList class.

Chapter *"A second look at classes and objects"*

- ☐ Use static class members.
- ☐ Passing references to object as arguments to methods and returning references to object from methods
- ☐ Overriding the equals method and copy objects
- ☐ Use aggregation and be able to use class collaborations
- ☐ Use the *this* reference
- ☐ Knowledge about the garbage collection

Examination

Examination of this module is made through a mini-project. It consists of **individual programming hand-in assignment** containing all the parts referred to in this module and earlier modules. The assignment has to be complemented by a written report, and you can be subject of an oral explanation of what you have developed. In this module also theoretical questions may occur. In addition a reflection of this module **must** be submitted.

When is the examination of this module?

Answer: See the mini project

Where do you find your examination?

Answer: You will find the exam on the course web site at http://learn.du.se under Course materials - Course_Modules - 3nd_Course_Module – Exam for module 3, the mini-project

Criteria that you must fulfill for grade G are:

- Be able to develop an object oriented program consisting of at least two different classes that you have created. Instances of those classes shall be used in the program. The program shall have a user interface that make it possible for the users of the program to store, read and manipulate data. The data shall be kept in some sort of data structure.
- Be able to explain your design of a program with help of relevant terminology and class diagrams according to UML.
- To write clear and logic correct code. The style of the code has to follow the examples in the textbook. Logic correct code is code that fills some purposes for the program functionality.
- To write and use classes where encapsulation is implemented in a correct way.

Criteria that you must fulfill for grade VG are:

- Fulfill the criteria for grade G.
- Hand in the mini-project before a certain date.
- No need for a correction of the mini-project after it has been handed in.
- Be able to store a set of data in a program to a text file and read it back into the program from the text file.
- To show an ability to solve more complicated and complex problems then for grade G with help of program development.

Literature References

In the course book: *Starting Out with Java - From Control Structures through Objects*:

- Chapter: *Arrays and the ArrayList Class*
- Chapter*: A Second Look at Classes and Objects*

Presentations / Lectures

To get access to the Java SE API documentation in NetBeans

You will always get information about a class that you want to use with help of the NetBeans auto completion system. That system shows up a small window with information about the current method or class that you want to use in your code. But sometimes you don't know if there is an already written class that can help you in your program development. Then it can be practical to search throw the Java SE API documentation. The web address to the documentation is https://docs.oracle.com/javase/8/docs/api/ .

In NetBeans, you can also get information from the API-documentation. Place the cursor on a concept that you are interested in and simultaneously press the two keys Alt and F1, and then the information about the selected concept is displayed in your web browser.

If the sound is not synchronised with the video during a lecture, then click on the prompter of the progress bar at the lower part of the window. The performing of the lecture will then pause. Continue playing the lecture by clicking on the play button to left of the progress bar. When you do that the sound are resynchronised with the video.

You are expected to read the following chapters and paragraphs in your textbook. It is also expected that you take part of the recorded lectures.

Chapter: Arrays and the ArrayList Class

The first part of the chapter you have been studying in module 2. Now we will continue with the later part of the chapter.

Arrays of Objects

Lecture: Arrays of Objects
Lecture: ObjectArray

The Sequential Search Algorithm

To know the most common algorithm for searching the position of a specific item in an array is very useful.

Two Dimensional Arrays

It's important two know how to use two dimensional arrays. To use two dimension arrays is not more complicated than using one a one dimensional array. The syntax will grow because you have one more dimension to take care of. But if know how use a one dimensional array it should be possible for you read and understand this paragraph by your own.

Arrays with Three or More Dimensions

You only need to read throw this paragraph briefly.

The Selection Sort and the Binary Search Algorithms

In many situations you will need to sort the content of an array. The selection sort is one of the most useful sorting algorithms. It's not so complicated and it performs always quit well, compared to other simple sorting algorithms.

Binary searching is at tremendous fast searching algorithm. The drawback is that the array has to be sorted.

Command-Line Arguments and Variable-Length Argument List

You only need to read throw this paragraph briefly.

The ArrayList Class

Lecture: The ArrayList Class
Lecture: ArrayListDemo1
Lecture: ArrayListDemo3
Lecture: ArrayListDemo5
Lecture : ArrayListDemo6

Common Errors to Avoid

You must understand this paragraph. If not, you have to go back into the chapter and check up the things that you have missed.

Chapter: A Second Look at Classes and Objects

Static Class Members
Lecture: Static Class Members
Lecture: StaticDemo
Lecture: MetricDemo

Passing Objects as Arguments to Methods
Lecture: Passing Objects as Arguments to Methods
Lecture: PassObject2

Returning Objects from Methods
You have to read this paragraph carefully. It's very important that you understand how to return references from methods.

The toString Method
Lecture: The toString Method
Lecture: StockDemo1

Writing an equals Method
Lecture: Writing an equals Method
Lecture: StockCompare

Methods That Copy Objects
Lecture: Methods That Copy Objects
Lecture: ObjectCopy

Aggregation
Lecture: Aggregation
Lecture: CourseDemo

The this Reference variable
Lecture: The this Reference variable
Lecture: ObjectCopy

Enumerated Types
Lecture: Enumerated Types
Lecture: SportCarDemo2

Garbage Collection
Lecture: Garbage Collection

Focus on Object-Oriented Design: Class Collaboration
Lecture: Fokus on Object-Oriented Design: Class Collaboration
Lecture: DrawingClassDiagrams01
Lecture: DrawingClassDiagrams02

Example of UML tool ...
You can download Astah UML Tool from, (free for students)
http://astah.net/download#uml

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Exercises from the Course Book

Complete all **Checkpoints** in each chapter. To some extent the Checkpoints ensure that you understood the main points in a subchapter.

Review Questions and Exercises in chapter "Arrays and the ArrayList Class"

True/False and Multiple Choice
Answer all questions

Find the Error
Answer all questions

Algorithm Workbench
Complete all exercises

Short Answer
Answer all questions

Programming Challenges
Complete all programming exercises

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Complete all programming exercises