# Project Guide for *Data Structures and Algorithms*

Course: Data structures and algorithms

Important dates:

Submit your group information before Dec 9th

Submit other documents before Dec 23rd

## Intended Learning Outcomes

1. Work productively using appropriate theory knowledge from the course as well as the programming tools.
2. Search information from the internet and electronic resources efficiently and evaluate information for problem solving.
3. Build a program implementing all the proper functions listed on the project report.
4. Write a report to fully describe the work of the project.

## Description

1. Problem definition and demand analysis

You should fully analysis and understand the problem according to your proposal. You should define the known information, constrains and objective.

1. Design of the data structure

You should define the data structure as well as their operations of which you are using to accomplish your project.

1. Design of the main framework

You should divide your program into several modules. Each module is responsible for one simple task. By assembling all the modules, your program should be able to solve the problem listed on your proposal. You should design the relationship between each module (draw a graph to illustrate this)， such that the system have a clear structure which can be debugged easily.

1. Detailed design

You should design each module in detail, specifying its function and operation using pseudocode to describe the algorithms you used.

1. Programing and Debugging

According the detailed design, you should code the program by yourselves to meet all the requirements in the proposal. The program should give the correct result. You should use debugging tools to eliminate any bugs in your program. The debugging can be done separately for each module. Make sure that each module does its function properly.

1. Analysis

You should record the output of your program from feeding both the expected inputs or the unexpected ones. You should also analyze the time complexity of the algorithms in your program.

## What to do

* The aims of the project are to develop students’ ability on information search, programming and report writing skill.
* Each group should do extensive researches on your selected topic. Your work should be recorded and presented consistently and professionally in two forms, which are the program and the report.

### Program (50%)

You should apply your coding skills to implement a program which can solve the problem of the chosen topic.

The items you should submit include but not limited to:

1. The source codes
2. The executable file
3. The user’s guide for you program

### Report (50%)

You should write a report to detail your design.

The content of your report should include but not limited to:

1. Title
2. Abstract (no more than 200 words)
3. Problem definition and demand analysis
4. Design of the main framework
5. Detailed design (including the design of the data structures)
6. Testing and analysis
7. Conclusion
8. References

## Project Groups

* The projects must be conducted by a group of 2 to 4 students.
* The project grading criteria depends on the submitted program and report.
* The marks for each member in the same group may differ according to the work he or she contributes.
* Each student can join one project group only.
* It is the students’ responsibility to form their own group.
* You must form your group and submit your group list to your tutor on or before Dec 9th.
* If you fail to form your group by the date above, we will assume that you give up the project and you will receive ZERO marks in you project.

## Requirements and submissions

### Program:

**The executable file**: the executable file must be submitted. It should be able to be run on one of the following operating system: windows, macOS or Linux. Please specify the operation system that your program can run on.

**The source code**: the source codes that produce the executable file must be submitted. The source code must be able to produce the exactly same executable file submitted.

**The user’s guide for you program:** describe how to use your program in this document

### Documents

**The report**: Each group must submit a report of their work.

**The contribution form**: Each member should submit the contribution form to describe his or her contribution for the project in detail.

Your program and document should be submitted before Dec 23rd

## Open topics

### Library management system

**Description**: The basic process of a library management consists of collection and storage, clear inventory, borrow, and return. Please design a management system for the above process.

**Requirements**:

1. The information for each book should contain at least the book ID, title, author, existing stock and total.
2. All the data can be stored in the prime memory without using files.
3. The system should implement the following functions:

Collection and storage: Add a new book. If books with the same ID exist already, increase its total number by 1.

Clear inventory: Remove books of one ID from the system.

Borrow: if the existing stock is greater than 1, then mark it has been borrowed. You should record the borrower’s license ID and the due time that he should return the book.

Return: Remove the borrowing information and change the existing stock of the book.

Display of other information.

### Student management system

**Description**: Design and implement a system to manage the information of students. The system contains the ID, name, age, gender information for each student; The course information contains the course ID, course name, marks for each student, and professor. The system should have the function of insert, remove, update, inquire, sort and count all the information.

**Requirements**:

1. The system should record information listed in the above description.
2. The information can be store in the file or only exists in the prime memory.
3. They system should be able to insert, remove, update, inquire, sort and count both the student information and the course information.
4. Sorting by the marks for one course should be implemented.