	VIETNAM NATIONAL UNIVERSITY OF HO CHI MINH CITY UNIVERSITY OF NATURAL SCIENCES **FACULTY OF INFORMATION TECHNOLOGY**

COURSE SYLLABUS

Course Code: TH103

Title: Data structures 1

Credits: 4

Workload:

Lecture hours:	**3** periods * **15** weeks = **45** periods
Laboratory hours:	**2** periods * **15** weeks = **30** periods
Preparative hours:	**2** periods * **15** weeks = **30** periods

Prerequisites: TH012 - Intermediate Programming A2

Course Objectives:

This course introduces methods to organize and manipulate basic data structures as well as develops students' capacity of designing algorithms to solve problems. The instruments used at this stage are high-level programming languages such as Pascal or C.

The course aims to help students to understand the importance of algorithms and data organization, which are the two most essential elements of programs. Besides, knowledge mastered at this stage will assist students in reinforcing and developing the programming skills learned in the previous stages.

Main Text: *Algorithms and Data Structures* (in Vietnamese)
Tran Hanh Nhi, Duong Anh Duc, Faculty of Information Technology,
University of Natural Sciences, Vietnam National University of Hochiminh City,
2002

References:

- *Algorithms + Data Structure = Programs*
  N. Wirth, 1981.
- *Data structures and Algorithm Analysis in C (Second Edittion)*
  Mark Allen Weiss -- Addison-Wesley, 1991.
- *The Art of Computer Programming, Vol.3, Searching and Sorting*
  D.E.Knuth – Addison Wesley, 1973.
- *Data Compression*
  David Salomon, Springer, 1998.
- *Handbook of Algorithms and Data Structures, in Pascal and C*
  G. Gonnet and R. Baeza-Yates -Addison-Wesley, 1991.
- *Introduction to Algorithms*, T.H.Cormen, C.L. Leiserson, R.L. Rivest, C. Stein, (2nd eds), MIT Press.

Course Outline

Chapter 1 Introduction to Data Structures

- 1.1 Introduction
- 1.2 Basic data structures: information representations and processing
  - 1.2.1 The concept of data types
  - 1.2.2 Original data types: Number systems and operations

Chapter 2 Search and Sort Algorithms
- 2.1 Introduction
- 2.2 Search Algorithms in Internal Memory
  - 2.2.1 Linear Search
  - 2.2.2 Binary Search
- 2.3 Sort Algorithms in Internal Memory
  - 2.3.1 Straight Insertion
  - 2.3.2 Straight Selection
  - 2.3.3 Bubble Sort, Shaker Sort
  - 2.3.4 Shell Sort
  - 2.3.5 Heap Sort
  - 2.3.6 Quick Sort
  - 2.3.7 Merge Sort
- 2.4 Analyze and compare Sorting Algorithms

Chapter 3 Dynamic Data Structures
- 3.1 Recursive Data Structures
- 3.2 Pointer Structures
- 3.3 Linked List
  - 3.3.1 Singly-Linked Lists
    - 3.3.1.1 Basic operations
    - 3.3.1.2 Ordered and Rearranged List
    - 3.3.1.3 Stack
    - 3.3.1.4 Queue
  - 3.3.2 Doubly-Linked Lists
  - 3.3.3 Circular Linked Lists
  - 3.3.4 Multiply-Linked List
  - 3.3.5 An application: Topology Sort

Chapter 4 Trees
- 4.1 Basic concepts and definitions
- 4.2 Overview of Binary Trees
  - 4.2.1 Constructing Binary Trees
  - 4.2.2 Basic operations on Binary Trees
- 4.3 Binary Search Tree
- 4.4 AVL Tree
- 4.5 B-Tree

Grading Final exam : 70%

Assignments: 30%