THAI NGUYEN UNIVERSITY
UNIVERSITY OF INFORMATION AND COMMUNICATION TECHNOLOGY

SOCIALIST REPUBLIC OF VIET NAM
Independence - Freedom – Happiness

COURSE SYLLABUS
(Training level: Undergraduate)

Course Title*:*

Vietnamese Course Title: Cấu trúc dữ liệu và thuật toán

English Course Title: Data structure and Algorithm

Course Code:

Major: **Information Technology**

Version: 2017

1. General Information

- Number of credits: 3 (Theory: 2; Practice: 1)

- Types of knowledge:

General Education		Base core courses		Major core courses		Concentration courses		Others
Required □	Optional □	Required x	Optional □	Required □	Optional □	Required □	Optional □	Alternative subject of Graduation Thesis □

- Required courses : None

- Pre-requisite: Programming techniques.

- Co-requisite: None

- Facility Requirements: The classroom is equipped with a projector and a whiteboard

- Practice Room: Have computers installed DEV C/C++5.11 software

- Departments in Charge: Computer Science and Technology Department.

2. Time Allocated

Total: 60 periods	Theory: 30 periods
	Discussion/ Group Presentation: 0
	Assignment/ Essay/ Practice: 28 periods.
	Tests: 2 *+ Theory: Number of Tests: Periods:.* *+Practice: Number of Tests: 2 Periods:2.*
Self-Study: 105 periods. Other activities (visiting, surveying, outdoor activities, organizing events, clubs): 0 periods (or sessions)	

3. Lecturer's Information

No.	Lecturer name	Phone number	Email	Note
1	MSc. Ha Thi Thanh	0982266009	htthanh@ictu.edu.vn	Leader
2	MSc. Duong Thi Quy	0947015947	dtquy@ictu.edu.vn	Member
3	MSc. Nguyen Thi Oanh	0981368808	ntoanh@ictu.edu.vn	Member
4	MSc. Dinh Khanh Linh	0977102556	dklinh@ictu.edu.vn	Member

4. Objectives

The course provides students with knowledge of data structures along with representation and implementation methods such as lists, stacks, queues, trees, binary search trees, graphs, tables, and dictionaries. Additionally, the course provides some basic algorithms such as searching and sorting, as well as algorithms on each data structure. Through this, students are able to analyze and choose appropriate representation structures and algorithms for specific problems. Moreover, this course also improves programming and algorithmic skills for students. The course helps students unleash their ability to develop ideas to solve practical problems using data structures and algorithms. This course contributes to the output standards L4 and L8 in the training program

5. Description of content and course learning outcome:

- Knowledge Standards: (1) Remember ⇨ (2) Understand ⇨ (3) Apply ⇨ (4) Analyze ⇨ (5) Create.

- Attitude Standards: (1) Copy ⇨ (2) Self-manipulation ⇨ (3) Masterfully repeating to the norm ⇨ (4) Combining multiple activities ⇨ (5) Completely proactive.

Notation CLOs	Contents	Level		PLOs
		Knoweldge	Skills	
C1	Understand basic concept of data structure, abstract data type, data model, and algorithm	2		
C2	Using arrays and pointers to represent lists		3	
C3	Understand how stacks and queues work.	2		
C4	Utilize stack and queue in some problems		3	
C5	Understand basic concepts and operations on trees, binary trees, binary search trees	2		
C6	Apply algorithms on binary trees, binary search trees.		3	
C7	Understand basic concepts and operations on Graph	2		
C8	Apply algorithms on Graph such as DFS, BFS		3	

6. Reading List

A. Main Syllabus

[1] Slide Data structure and Algorithm, Computer science and Technology department, ICTU.

[2] Data structure and Algorithm, Software engineer department, ICTU, 2016.

[3] Do Xuan Loi, 1995, Data Structures and Algorithms, Science and Technology Publishing House.

[4] Dinh Manh Tuong, 2003, Data Structures & Algorithms, Science and Technology Publishing House

B. References

[5] Aho, A. V. , J. E. Hopcroft, J. D. Ullman, 1983, Data Structure and Algorithms, Addison–Wesley.

[6] N. Wirth, 1983, Data structure + Algorithm= Program

C. Software

DEVC/C++

7. Score Assessment

- Score Scale: 10.

- Components Assessment:

Evaluation Time	Components Assessment	Course Learning Outcome	Factor	Score	Weight
During the duration of the course	Attendance: (score b_0)		1	$d=(b_0+b_1+b_2)/3$	30%
According to the teaching plan in section 9	Test No.1: (score b_1)	C1; C2 C3, C4	1		
	Test No.2: (score b_2)	C5, C6, C7, C8	1		
The end of the term.	Final exam	C1; C2; C3; C4; C5; C6; C7; C8;		e	70%
Final Score: (f)				f = d ×30% + e ×70%	

- Final exam: *question answering*

8. Regulations for students

8.1. Student's duties

Read the materials before attending.

Complete assignments.

Prepare the content for the discussions

8.2. Regulations on Exams and Academic Studies

Students must attend classes fully, ensuring a minimum of 80% attendance in class.

Students must complete assigned exercises

9. Teaching Plan

No	Period	Contents	Teaching Methodology	CLOs	References
1	3	**Chapter 1: Introduction** 1. From problems to programs 2. Basic concepts 2.1. Definition of data model 2.2. Abstraction 2.3. Abstract data type 2.4. Data 2.5. Representation of data in computer 2.6. Data types 2.7. Data structures 2.8. Algorithms 2.9. The relationship between data structures and algorithms 3. Algorithm analysis 4. The language of interpretive representation.	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment	C1	[1]. (53-92); [1].(423-493)
2	3	**Chapter 1: Introduction** 5. Recursion and recursive algorithms 6. Sorting algorithms 6.1 Statement of the sorting problem 6.2 Basic sorting algorithms 7. Search algorithms 7.1 Linear search. 7.2 Binary search	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment.	C1 C2	[1]. (6-28) [1]. (32-45) [2]. (332-400)
3	5	**Practice 1:** **Guiding Exercises/Assignment**	- Teaching: The teacher summarizes the theoretical content, provides examples, and assigns exercises.. - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment	C1 C2 C3	[1]. (6-28) [1]. (32-45) [1]. (53-92) [1]. (209-242)

No	Period	Contents	Teaching Methodology	CLOs	References
					[1]. (423-493) [2]. (332-400)
4	3	**Chương 2 : List** 1. Definition of list 2. List operations 3. Implement a list using an array structure - Implement operations on lists using array structures	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment..	C1	[1]. (209-242)
5	5	**Practice 2:** **Guiding Exercises/Assignment about list using array**	- Teaching: The teacher summarizes the theoretical content, provides examples, and assigns exercises.. - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment	C1	[1]. (209-242)

No	Period	Contents	Teaching Methodology	CLOs	References
6	3	**Chapter 2: List** 4. Impement the list using the pointer 4.1 Linked list 4.2 Types of linked lists 4.3 Implement operations on singly linked lists	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment.	C3	[1]. (712-763)
7	5	**Practice 3:** **Guiding Exercises/Assignment about linked list**	- Teaching: The teacher summarizes the theoretical content, provides examples, and assigns exercises.. - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment	C1 C3	[1]. (209-242) [1]. (712-763)
8	3	**Chapter 2: List** 5. Stack 5.1 Stack definition and its operations 5.2. Representation of Stack - Implement stack using array structure and operations. - Implement the stack with pointer and operations 5.3 Applications of Stack 6. Queue 6.1 Queuing definition and operations 6.2 Queue representation with array and pointers 6.3 Application of Queue	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment.	C4	[1]. (131-147) [1]. (249-267) [2]. (5-38)

No	Period	Contents	Teaching Methodology	CLOs	References
9	5	**Practice 4:** **Guiding** **Exercises/Assignment** **about stack and queue**	- Teaching: The teacher summarizes the theoretical content, provides examples, and assigns exercises.. - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment	C4 C5	[1]. (291-322)
		Progress test 1	The teacher asigns exercises, and students take the test	C1, C2, C3, C4	
10	3	**Chapter 3: Tree** 1 General Tree 1.1 Tree Definitions and Properties 1.2 The Tree Abstract Data Type 1.2 Tree Traversal Algorithms 1.3 Representation of tree and implementation operators	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment.	C5	[1]. (314-322) [1]. (338-355)
11	3	**Chapter 3: Tree** 2 Binary Trees 2.1 The Binary Tree Abstract Data Type 2.2 Properties of Binary Trees 2.3 Implementing Trees 2. 4 Tree Traversal Algorithms	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment.	C4 C5	[1]. (131-147) [1]. (249-267) [1]. (291-322) [2]. (5-38
12	3	**Chapter 3: Tree** 3. Binary Search Tree 3.1 Definition of binary search tree	- Teaching: Presentation; Identify the problem and solve it	C6 C7	[1]. (494-544)

No	Period	Contents	Teaching Methodology	CLOs	References
		3.2 Searching Within a Binary Search Tree 3.3 Insertions and Deletions	Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment.		[2] . (71-110)
13	5	**Practice 5:** **Guiding Exercises/Assignment about tree, binary tree, binary search tree**	- Teaching: The teacher summarizes the theoretical content, provides examples, and assigns exercises.. - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment	C6 C7	[1].(549-560) [1].(581-589)
14	3	**Chapter 4: Graph** 1 Graphs 2 Data Structures for Graphs 2.1 Edge List Structure 2.2 Adjacency List Structure 2.3 Adjacency Matrix Structure 3 Graph Traversals 3.1 Depth-First Search	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment.	C6 C7	[1] . (494-544) [2] . (71-110)
15	3	**Chapter 5: Set, table, dictionary** 1. Set 1.1 Concepts and operations 1.2 Methods of representing set 2. Table 2.1 Basic concepts and operations 2.2 Table representation methods	- Teaching: Presentation; Identify the problem and solve it Text book, slides, exercises and sample practical examples - Study in class: Study just learned materials, do writing exercises and	C6 C7	[1].(549-560) [1].(581-589)

No	Period	Contents	Teaching Methodology	CLOs	References
		3. Dictionary 3.1 Dictionary concepts and operations on dictionarie 3.2 Methods of representation of Dictionary	redo practical examples and do assignment		[2]. (71-110)
16	5	**Practice 6:** **Guiding Exercises/Assignment about Graph**	- Teaching: The teacher summarizes the theoretical content, provides examples, and assigns exercises.. - Study in class: Study just learned materials, do writing exercises and redo practical examples and do assignment	C6 C7	[1]. (549-560) [1]. (581-589) [2]. (71-110)
		Progress test 2	The teacher asigns exercises, and students take the test	C5, C6, C7, C8	

10. Competent Authority Approval: University of Information and Communication Technology

August 27th, 2017

Vice Rector   **Dean**   **Head of Department**   **Composer Team**

Ha Thi Thanh

Dinh Khanh Linh

PhD. Do Dinh Cuong   **PhD. Nguyen Hai Minh**   **McS. Nguyen Tuan Anh**

Nguyen Thi Oanh

Duong Thi Quy

11. Updated Procedure

1st update: **Updater**