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**THE BACHELOR OF COMPUTER AND INFORMATION SCIENCES**

**COLLABORATED BETWEEN**

**AUT UNIVERSITY (NEW ZEALAND)**

**AND**

**THE HCM UNIVERSITY OF SCIENCE, VNUHCM (VIETNAM)**

**CS104 – Data Structures**

**Course Syllabus**

1. **COURSE INFORMATION:**

Course name in Vietnamese: **Data Structures**Course name in English: **Cấu trúc dữ liệu**

Course code: **CS104**  
Prerequisites: **CS103 – Introduction to Programming** Course moodle: www.itec.hcmus.edu.vn/course/

Instructor: MSc. Cao Xuan Nam

Lab Instructor: MSc. Cao Xuan Nam

MSc. Le Nguyen Tuong Nhi

Number of credits: 4 Lecture credits: 3 Lab credits: 1

Number of Lecture hours: 40 Number of Lab hours: 30

Number of Self-study hours: at least 100 hours

1. **COURSE OBJECTIVES:**

After finishing the course, student can:

* Understand clearly the definitions, applications, the algorithms used with the data structures, and the implementations in C/C++.
* Know how to estimate the algorithm complexity
* Design their own data structures, algorithms in the programming problems

1. **COURSE DESCRIPTION:**

This course aims to equip students for the knowledge of abstract data structures: linked list, tree structure, stack, queue, hash table, graph,.. and the applications of these data structures. This course also gives the students the algorithms of searching, sorting, minimum spanning tree, shortest path,.. All the data structures and algorithms are analyzed clearly.

1. **COURSE OUTCOMES:**

|  |  |  |
| --- | --- | --- |
| **AUT course outcomes** | **Matching course teaching/ studying methodologies** |  |
| **[1] Knowledge** | |  |
| Algorithm complexity | **Lecture**  **Group discussion** | **A1** |
| Abstract data structures: linked list, tree structure, stack, queue, hash table, graph.. and the applications of these data structures | **Lecture**  **Group discussion** | **A2** |
| Algorithms of searching, sorting, minimum spanning tree, shortest path | **Lecture**  **Group discussion** | **A3** |
| **[2] Skills** | |  |
| Critical thinking or problem-solving skills | **Group discussion**  **Weekly assignment** | **B1** |
| Developing skills | **Mini project** | **B2** |
| Reading skills | **Weekly assignment** | **B3** |
| Group management | **Mini Project** | **B4** |
| **[3] Study attitude** | |  |
| Active learning in class | **Group discussion** | **C1** |
| Active research/reading at home | **Weekly assignment** | **C2** |
| Opportunity to practice problem-based learning skills | **Group discussion**  **Weekly assignment**  **Mini project** | **C3** |

1. **COURSE ATTENTIVE DETAILS:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Week** | **Teaching content** | **Lecture activities** | **Lab activities** | **Weekly homework/ assignment/quiz** | **Matching with**  **course outcomes** |
| Week 1 | Chapter 1 : Basic concepts (4 hours)  1.1 Relations; Abstract Data Type  1.2 Data structures  1.3 Algorithm complexity | Lecture  Group Discussion |  | Quiz 01 | A1,B1,B3,  C1,C2,C3 |
| Week 2 | Chapter 2: Basic data structures (4 hours)  2.1 Linked lists  2.2 Stack  2.3 Queue  2.4 Polish notation | Lecture  Group Discussion | Lab 01 | Quiz 02 | A2,B1,B2,B3,B4,  C1,C2,C3 |
| Week 3 | Chapter 3 : Tree structure (12 hours)  3.1 Definitions  3.2 Traversal methods  3.3 Binary Tree  3.4 Perfect Binary Tree  3.5 Complete Binary Tree  3.6 Binary search tree | Lecture  Group Discussion | Lab 02 | Quiz 03 | A2,B1,B3,  C1,C2,C3 |
| Week 4 | Chapter 3 : Tree structure (12 hours)  3.7 Balanced Tree  3.8 AVL Tree | Lecture  Group Discussion | Lab 03 | Quiz 04 | A2,B1,B3,  C1,C2,C3 |
| Week 5 | Chapter 3 : Tree structure (12 hours)  3.9 Red Black Tree  3.10 B+ Tree | Lecture  Group Discussion | Lab 04 | Quiz 05 | A2,B1,B2,B3,B4,  C1,C2,C3 |
| Week 6 | Chapter 4: Sorting algorithms (8 hours)  4.1 Definitions  4.2 Insertion Sort  4.3 Bubble Sort  4.4 Heap Sort | Lecture  Group Discussion | Lab 05 | Quiz 06 | A3,B1,B3,  C1 |
| Week 7 | Chapter 4: Sorting algorithms (8 hours)  4.5 Quick Sort  4.6 Merge Sort  4.7 Bucket Sort  4.8 Radix Sort | Lecture  Group Discussion | Lab 06 | Quiz 07  Midterm | A3,B1,B3,  C1,C2,C3 |
| Week 8 | Chapter 5 :Hash Table (4 hours)  5.1 Definitions  5.2 Hash function  5.3 Mapping Down  5.4 Chained Hash Table  5.5 Open Addressing  5.5.1 Linear Probing  5.5.2 Quadratic Probing  5.5.3 Double Probing | Lecture  Group Discussion | Lab 07 | Quiz 08 | A2,A3,B1,B3,  C1,C2,C3 |
| Week 9 | Chapter 6 : Graph Theory (8 hours)  6.1 Definition  6.2 Minimum Spanning Tree  6.2.1 Prim’s algorithm  6.2.2 Kruskal’s algorithm | Lecture  Group Discussion | Lab 08 | Quiz 09 | A2,A3,  B1,B2,B3,B4,  C1,C2,C3 |
| Week 10 | Chapter 6 : Graph Theory (8 hours)  6.3 Shortest Path  6.3.1 Dijkstra’s algorithm  Summary | Lecture  Group Discussion | Lab 09 | Quiz 10 | A3,  B1,B3,  C1,C2,C3 |

1. **COURSE ASSESSMENT:**

|  |  |  |
| --- | --- | --- |
| **Categories** | **% Course grade** | **Satisfying course outcomes** |
| Quizzes | 10% | A1,A2,A3,B1,B3,C1,C2,C3 |
| Lab | 30% | A1,A2,A3,B2,B3 |
| Midterm | 20% | A1,A2,B1,B2,B3,B4,C3 |
| Final | 40% | A1,A2,A3,B1,B2,B3,B4,C3 |
| **TOTAL** | **100%** | |

**LABS:**

Lab 01 – 09: Mini projects.

Criteria:

* Project Completion
* Correction

**QUIZZES:**

Quiz 01 – 10: 15-20 minutes/quiz. It’s included either multiple choices or essay.

Grade: 1% / quiz

Criteria:

* Completion
* Correction

**EXAMS:**

* Midterm exam: 60-minute page-based exam (20%)
* Final exam: 90-minute page-based exam (40%)

1. **COURSE MATERIALS/ READINGS:**

[1] Adam Drozdek (2001), Data structures and Algorithms in C++ (Second Edition), Addison-Wesley.

[2] Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein (2001) , Introduction to Algorithms (Second Edition), The MIT Press and McGraw-Hill Book Company.

1. **SOFTWARE NEEDED FOR LAB SESSIONS:**

Microsoft Visual Studio 2005 and above

**BCIS VN Program Coordinator Lecturer**

(Sign and write your name)

**APPENDICES:**

**BCIS VN PROGRAM GRADING SCALE**

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| --- | --- | --- | --- |
| **10 Grading scale** | **100 Grading scale** | **4 Grading scale** | **Letter grading scale** |
| 9 – 10 | 90 – 100 | 4 | A+ |
| 8.5 – below 9 | 85 – 89 | 4 | A |
| 8 – below 8.5 | 80 – 84 | 3.7 | A- |
| 7.5 – below 8 | 75 – 79 | 3.3 | B+ |
| 7.0 – below 7.5 | 70 – 74 | 3 | B |
| 6.5 – below 7 | 65 – 69 | 2.7 | B- |
| 6.0 – below 6.5 | 60 – 64 | 2.3 | C+ |
| 5.5 – below 6 | 55 – 59 | 2 | C |
| 5.0 – below 5.5 | 50 – 54 | 1.7 | C- |
| 4.0 – below 5.0 | 40 – 49 | 1.3 | F |
| 3.0 – below 4.0 | 30-39 | 1 | F |
| 2.0 – below 3.0 | 20-29 | 0.7 | F |
| 1.0 – below 2.0 | 10-19 | 0.3 | F |
| below1.0 | below10 | 0 | F |

**ATTENDANCE POLICY:**

1. A student is expected to fulfill all requirements and obligations of courses in which she/he is registered.
2. It is the prerogative of each individual instructor, discipline faculty, or division to determine the importance of class attendance. Any instructor who elects to have a class attendance policy will set forth the policy for that term in the course syllabus.
3. If a student is absent because of illnesses or family emergencies, it is his/her responsibility to notify his/her course instructor’s in advance, if at all possible. It is the student’s responsibility to consult with his/her instructor(s) upon return about how to make up for the missed work. The instructor has final authority in these matters. In the event of an emergency, the student may contact ITEC Admin Office. ITEC Admin Office will then e-mail notification to the student’s instructors.
4. Absences might also occur because of planned events. All students are encouraged to participate in activities outside of the classroom, yet these activities may conflict with class times. It is the student’s responsibility to consult with the instructor in advance to ascertain whether the absence will be allowed, to submit all written work on time, and to arrange for reasonable make-up times and methods. Although instructors may wish to facilitate student participation in these activities, the nature of courses, laboratories, and practicum experiences may require that the student attend class in order to ensure successful completion of the course. The instructor has the final authority in these matters.

**PARTICIPATION GRADING RUBIC:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Exceeded Expectations** |  |  |  | **Did Not Meet Expectations** |
| Attended all class sessions, on time | 4-5 | 2-3 | 0-1 | Missed multiple sessions, or was late. |
| Participated in class discussion by adding new and insightful thoughts and ideas | 3 | 2 | 1 | Did not participate in class discussion and/or did not add insightful thoughts or ideas |
| Shows tolerance for other points of view. Willing to disagree with ideas and concepts, not people | 3 | 2 | 1 | Interrupt others. Pushes personal agenda rather than class agenda |
| Seldom focused cell phone laptop, or notebook during class | 4-5 | 2-3 | 0-1 | Often focused on cell phone, laptop, or notebook during class. |

**ACADEMIC DISHONESTY/CHEATING:**

AUT and HCMUS expects its students to adhere to high ethical standards in pursuing their academic goals. Plagiarism and other forms of cheating will not be tolerated and will result in disciplinary action.