



浙江大學

**COMP923**

**Data Structures & Algorithms**

## Instructor contact details

Lecturer-in-charge: TBA

Email: TBA or send general enquiries to [wlwyxy\\_29@zju.edu.cn](mailto:wlwyxy_29@zju.edu.cn)

Office location: to be announced

Consultation Times: to be announced, and by appointment

## Teaching Times and Locations

The Time and Location: TBA, Zhejiang University Huajiachi Campus

Lecture sessions include lectures, as well as in-class discussions and test(s).

## Academic Level

Postgraduate

## Units of Credit

The course is worth 6 units of credit at Zhejiang University, with total of 40 teaching hours.

## Overview

This unit will teach some powerful ideas that are central to solving algorithmic problems in ways that are efficient. In particular, students will learn how data collections can support efficient access, for example, how a dictionary or map can allow key-based lookup that does not slow down linearly as the collection grows in size. The data structures covered in this unit include lists, stacks, queues, priority queues, search trees, hash tables, and graphs. Students will also learn efficient techniques for classic tasks such as sorting a collection. The concept of asymptotic notation will be introduced and used to describe the costs of various data access operations and algorithms.

## Prerequisites

None

## Learning Resource

Lecture handouts will be given in class.

## Recommended Texts

- Robert Sedgewick, *Algorithms in C, Parts 1–4* 3rd edition, Addison Wesley, 1998.
- Robert Sedgewick, *Algorithms in C, Part 5* 3rd edition, Addison Wesley, 2002.

The following introduction to the C programming language is also recommended:

- Alistair Moffat, *Programming, Problem Solving, and Abstraction with C* 5th edition, Pearson, 2003.

## Teaching Strategies

- Lectures introduce concepts and show examples
- Problem sets reinforce concepts, provide additional examples and allow students to solve problems
- Assignments further reinforce concepts and allow students to solve larger problems
- Mid-term examination test understanding and skills

## Teaching Rationale

- Lectures will include worked programs that explain concepts as well as mathematical analyses used in performance measurement. Exercises are provided that reinforce learning and develop programming skills. Assignments are an opportunity to apply your skills to larger problems.
- Be mindful of the importance of spending time on actual programming. The C language is particularly complex requiring attention to both high-level design and low-level detail at the same time. Most students require a whole session of practice at C programming to achieve the required level of competency.

## Course Delivery

The course will be taught in English through lectures, seminars, field trips, group activities and presentations. In addition to these, there will also be guest speakers and optional field trips available for students who would like to enhance their learning experience. The course sessions will be running during the weekdays, Monday to Friday. The course will be at a total of 40 hours.

## Topics and Course Schedule

| Date  | Description   | Day            |
|-------|---|----------------|
| Day 1 | <ul style="list-style-type: none"><li>• Administrivia</li><li>• Definitions and precision regarding scalability and analysis of algorithms</li><li>• Algorithm analysis, review of Unix operating system and Java</li></ul> | 23 / 12 / 2019 |
| Day 2 | <ul style="list-style-type: none"><li>• Stacks and Queues</li><li>• Abstract Data Structures</li></ul>  | 24 / 12 / 2019 |
| Day 3 | <ul style="list-style-type: none"><li>• Tree concepts and definitions</li><li>• Recursion on a tree</li><li>• Binary tree implementation, general tree implementation</li></ul>   | 25 / 12 / 2019 |
| Day 4 | <ul style="list-style-type: none"><li>• Binary tree implementation, general tree implementation; recursion on a tree</li><li>• Balanced binary search tree (AVL tree)</li></ul>   | 26 / 12 / 2019 |

|        |  |                |
|--------|--|----------------|
| Day 5  | <ul style="list-style-type: none"> <li>• Simple map implementation by list (sorted and unsorted)</li> <li>• Priority queues; heap-as-a-tree and heap-in-array; sorting using priority queue</li> </ul> | 27 / 12 / 2019 |
| Day 6  | <ul style="list-style-type: none"> <li>• Hashing</li> <li>• Mid-term examination</li> </ul>  | 28 / 12 / 2019 |
| Day 7  | <ul style="list-style-type: none"> <li>• Graph representations</li> <li>• Graph traversals</li> </ul>  | 29 / 12 / 2019 |
| Day 8  | <ul style="list-style-type: none"> <li>• Shortest path algorithm</li> </ul>  | 02 / 01 / 2020 |
| Day 9  | <ul style="list-style-type: none"> <li>• Minimum weight spanning tree algorithms</li> </ul>  | 03 / 01 / 2020 |
| Day 10 | <ul style="list-style-type: none"> <li>• Greedy Method</li> <li>• Problem Sets</li> </ul>  | 06 / 01 / 2020 |
| Day 11 | <ul style="list-style-type: none"> <li>• Divide-and- conquer</li> </ul>  | 07 / 01 / 2020 |
| Day 12 | <ul style="list-style-type: none"> <li>• Randomized algorithms</li> </ul>  | 08 / 01 / 2020 |
| Day 13 | <ul style="list-style-type: none"> <li>• Review of Unit of Study and exam Preparation</li> </ul>   | 09 / 01 / 2020 |
| Day 14 | <ul style="list-style-type: none"> <li>• Assessment Due: Final exam</li> </ul>   | 10 / 01 / 2020 |

## Assessments

Details on each of the assessments will be discussed during class lectures.

|                      |     |                          |
|----------------------|-----|--------------------------|
| Assignment           | 30% | Due date: 09 / 01 / 2020 |
| Problem Sets (Group) | 15% | In class: 07 / 01 / 2020 |
| Mid-term examination | 25% | In class: 28 / 12 / 2019 |
| Final exam           | 30% | In class: 10 / 01 / 2020 |

## Grade Descriptors

|    |                  |          |
|----|------------------|----------|
| HD | High Distinction | 85 - 100 |
| D  | Distinction      | 75 - 84  |
| CR | Credit           | 65 - 74  |
| P  | Pass             | 50 - 64  |
| F  | Fail             | 0 - 49   |

**High Distinction 85-100**

Treatment of material evidences an advanced synthesis of ideas  
Demonstration of initiative, complex understanding and analysis  
Work is well-written and stylistically sophisticated, including appropriate referencing, clarity, and some creativity where appropriate  
All criteria addressed to a high level

#### **Distinction 75-84**

Treatment of material evidences an advanced understanding of ideas Demonstration of initiative, complex understanding and analysis Work is well-written and stylistically strong  
All criteria addressed strongly

#### **Credit 65-74**

Treatment of material displays a good understanding of ideas  
Work is well-written and stylistically sound, with a minimum of syntactical errors All criteria addressed clearly

#### **Pass 50-64**

Treatment of material indicates a satisfactory understanding of ideas Work is adequately written, with some syntactical errors  
Most criteria addressed adequately

#### **Fail 0-49**

Treatment of ideas indicates an inadequate understanding of ideas Written style inappropriate to task; major problems with expression Most criteria not clearly or adequately addressed

#### **Academic Integrity**

Students are expected to uphold the university's academic honesty principles which are an integral part of the university's core values and principles. If a student fails to observe the acceptable standards of academic honesty, they could attract penalties and even disqualification from the course in more serious circumstances. Students are responsible for knowing and observing accepted principles of research, writing and any other task which they are required to complete.

Academic dishonesty or cheating includes acts of plagiarism, misrepresentation, fabrication, failure to reference materials used properly and forgery. These may include, but are not limited to: claiming the work of others as your own, deliberately applying false and inaccurate information, copying the work of others in part or whole, allowing others in the course to copy your work in part or whole, failing to appropriately acknowledge the work of other scholars/authors through acceptable referencing standards, purchasing papers or writing papers for other students and submitting the same paper twice for the same subject.

This Academic Integrity policy applies to all students of the Zhejiang University in all programmes of study, including non-graduating students. It is to reinforce the University's commitment to maintain integrity and honesty in all academic activities of the University community.

**Policy:**

- The foundation of good academic work is honesty. Maintaining academic integrity upholds the standards of the University.
  
- The responsibility for maintaining integrity in all the activities of the academic community lies with the students as well as the faculty and the University. Everyone in this community must work together to ensure that the values of truth, trust and justice are upheld.
  
- Academic dishonesty affects the University's reputation and devalues the degrees offered.
  
- The University will impose serious penalties on students who are found to have violated this Policy. The following penalties may be imposed:
  - o Expulsion;
  - o Suspension;
  - o Zero mark/fail grade;
  - o Marking down;
  - o Re-doing/re-submitting of assignments or reports; and o Verbal or written warning.