Engineering Tripos Part IIB, 4M26: Algorithms and Data Structures, 2026-27

Module Leader

Prof Per Ola Kristensson [1]

Lecturers

Prof Per Ola Kristensson, Dr A Tewari, Dr E Wu [2]

Timing and Structure

Lent term. 16 lectures (including two integrated examples classes). Assessment: 100% exam.

Aims

The aims of the course are to:

- Introduce the principles behind algorithm and data structure design and evaluation.
- Cover key topics including elementary and advanced data structures, including sorting algorithms, graph algorithms, and so on.
- Provide an understanding of how to translate algorithms into code for selected engineering problems through coding-focused computerised examples papers.

Objectives

As specific objectives, by the end of the course students should be able to:

- Analyse the computational efficiency of algorithms.
- Re-implement and debug algorithms.
- Correctly choose a suitable algorithmic solution and set of data structures for a computational problem.
- Understand the theoretical and practical advantages and disadvantages of various algorithmic approaches and established solutions.
- Devise and implement new algorithms and data structures, or modify existing algorithms and data structures, to solve previously unencountered tasks.

Content

- **Part 1: Fundamentals of Algorithms and Data Structures (7L + 1 Example Class)**
  - Interpreting and writing pseudocode, demonstrating correctness, arriving at tight/lower/upper bounds of running time/storage, and solving computational problems using a repertoire of data structures and algorithmic approaches.
- **Part 2: Algorithms and Data Structures in Engineering (7L + 1 Example Class)**
  - Translating pseudocode into code, debug implementations of algorithms and data structures, apply algorithms and data structures to solve a range of frequent engineering problems, such as finding shortest paths, resource allocation, and scheduling.

Booklists

Introduction to Algorithms (3rd ed) *by Cormen, T., Leiserson, C., Rivest, R., Stein, C. The MIT Press. ISBN:978-0-262-03384-8.*

Also, please refer to the Booklist for Part IIB Courses for references to this module, this can be found on the associated Moodle course.

Examination Guidelines

Please refer to Form & conduct of the examinations [3].

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