COM1009
Introduction to Algorithms and Data Structures

Topic 0: Introduction

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Based on ideas and material developed by Dirk Sudholt, Pietro Oliveto and others.
Many thanks!

What this is about

- **Algorithms** for solving computational problems
- **Understanding** how algorithms work
- How **efficient** is my algorithm?
- How to **design** efficient algorithms?
  - Greedy algorithms
  - Divide and conquer
  - Dynamic programming
- **Data structures**, efficiency of operations, and how to use data structures efficiently.

Why care about Theory of Algorithms?

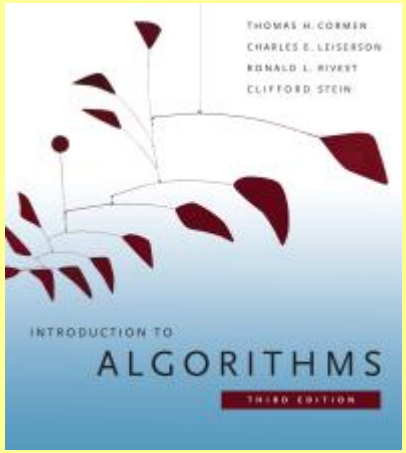
- Living in the **Age of Algorithms**
- Programming $\rightarrow$ Computer **Science**
- Can do so much more if you understand your algorithms
- Design and analysis of algorithms is **at the heart of Computer Science**
- Things every computer scientist is expected to know
- **Employability** – Google, Amazon, etc. require algorithms
- Preparation for
  - COM2109 Automata, Computation and Complexity
  - COM3105 Advanced Algorithms
  - and others …

Essential reading

T. H. Cormen et al.

Introduction to Algorithms, 3rd edition (2009)

MIT Press



The library provides **free online access** to this book.

Timetable

- Lectures
  - Live online lectures using Blackboard
  - Wednesday 11.00-12.50, with a 10-minute break in the middle

	1	2	3	4	5	6	7	EASTER	8	9	10	11	12
Lectures													
Tutorials													
Quiz													
Repeat													

Quiz = Threshold Assessment;
Repeat = Repeat assessment for those who fail the quiz
The Easter vacation lasts 3 weeks.
The EXAM will take place in the exam period at the end of semester.

Tutorial sessions (Blackboard)

	MON	TUE	WED	THU	FRI
0900-0950	Groups 1 & 2			Group 7	
1000-1050	Group 3			Group 8	
1100-1150			LECTURE		
1200-1250	Groups 4 & 6				
1300-1350	Group 5				

Demonstrators	
Group 1: Michail & Krusha	Group 5: Fahad & Georgia
Group 2: Marina & Urszula	Group 6: Michail & Aleksandra
Group 3: Marina & Urszula	Group 7: Marcin & Krusha
Group 4: Fahad & Georgia	Group 8: Krusha & Aleksandra

Two-part Assessment

Threshold Assessment (Online Quiz, Week 7)

- You need to show you've met the module's **learning outcomes** to a *minimum standard*
- Only covers the basic material that everyone ought to know and understand
- Passing this assessment means you automatically pass the entire module (with a grade of 40%)
- A practice quiz will be available before week 7
- More details are available on Blackboard

Grading Assessment (End of Year Exam)

- Covers the more advanced material
- You do not need to pass this exam separately
- This is your chance to raise your grade from 40 as high as you can

What are the “learning outcomes”?

You should be able to

- appreciate what constitutes an **efficient** and an **inefficient** solution to a computational problem;
- **analyse** the efficiency of an algorithm;
- evaluate and choose **data structures** that support efficient algorithmic solutions;
- identify and apply **design principles** such as greediness, divide and conquer and dynamic programming in the design of efficient algorithms;
- describe **efficient algorithms for fundamental computational problems**, along with their computational complexity

This is different to COM1003/COM1005: our focus is on analysing efficiency

Expectations on you

- **Attend lectures** and participate (ask questions, take notes)
- **Attend tutorials** and participate (ask questions)

READ THE BOOK

- Recap slides/notes/lecture recordings after each lecture
- Attempt all the exercise sheets

What a student says

- Quote from Lyes Bouakaz, former Computer Science/FCE Student Ambassador for Learning & Teaching (SALT)

"Your top tip for studying success:

Make sure that you understand everything you have been taught before the end of each week. It makes revision much easier and quicker, and the whole exam period is less stressful if you really are revising rather than trying to learn things you didn't understand before!"