COMP36111: Advanced Algorithms I
Lecture 0: Introduction and Course Organization

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2019–20
Outline

Syllabus

Resources
• Part A: Algorithms
  • Directed graphs: Tarjan’s algorithm and topological orderings
  • Undirected graphs: union find and the inverse Ackerman function
  • Flow optimization and matching
  • The stable marriage problem and the Gale-Shapley algorithm
  • String matching and the KMP algorithm.
• Part B: Complexity
  • Turing Machines and computational complexity
  • Some problems from logic: upper bounds
  • Hardness and reductions: Cook’s theorem
  • Some problems from graph theory: 3-colouring, Hamiltonian and Eulerian circuits, the TSP
  • Some problems from logic: lower bounds
  • Savitch’s theorem and the Immerman-Szelepcsényi theorem
  • How to pass the exam.
• Coursework (30%)
  - 36111-cwk1-F-Formulating Arguments; Out of 20; Deadline End Wk II Oct 4th 14:00 (formative)
  - 36111-cwk2-S-exercisesA; Out of 20; Deadline End Wk IV Oct 18th 14:00 (summative)
  - 36111-cwk3-S-exercisesB; Out of 20; Deadline End Wk IX Nov 22nd 14:00 (summative).

• Exam (70%)
  - Answer 3 questions in 2 hours.
  - Previous years’ exams provide a guide to the style of questions.
Outline

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Resources
• Course texts

Title: Algorithm design and applications  
Author: Goodrich, Michael T. and Roberto Tamassia  
ISBN: 9781119028482  
Publisher: Wiley  
Year: 2014 (available as e-book)

Title: Introduction to the theory of computation (2nd ed.)  
Author: Sipser, Michael  
ISBN: 0619217642  
Publisher: Thomson/Course Technology  
Year: 2006 (there is also a 3rd edition, 2013)
• Principal course website
  http://studentnet.cs.manchester.ac.uk/ugt/2019/COMP36111/syllabus/
• This course does not use blackboard.
• Course materials page
  http://studentnet.cs.manchester.ac.uk/ugt/2019/COMP36111/
  • homework exercises
  • lecture overheads
  • fun problems
• Import notice: UKIEPC programming competition: http://ukiepc.info/2019/