Course Outline

Course Details

Course Code	COMP3121
Course Title	Algorithms and Programming Techniques
Convenor	Raveen de Silva
Admin	Anahita Namvar
Classes	Wednesday 16:00 - 18:00 and Friday 14:00 - 16:00
Consultations	Thursday 12:00 - 13:00 and Friday 17:00 - 18:00
Units of Credit	6
Course Website	http://cse.unsw.edu.au/~cs3121/21T3/ (http://cse.unsw.edu.au/~cs3121/21T3/)
Handbook Entry	http://www.handbook.unsw.edu.au/undergraduate/courses/current/COMP3121.html (http://www.handbook.unsw.edu.au/undergraduate/courses/current/COMP3121.html)

Course Information

Subject Introduction

- COMP3121 Algorithms and Programming Techniques
- COMP9101 Design and Analysis of Algorithms

Offered

- All trimesters, every year until the Apocalypse

Objectives

The courses COMP3121/9101 are about problem solving. Before you can start programming, you must first solve the problem at hand. Thus, we will not just go over a cookbook of some well-known algorithms which you have to memorize and just learn how to implement. Instead, we will learn how to design “from scratch” new algorithms for solving new problems, using various design techniques (greedy, dynamic programming, divide and conquer, etc). We will also learn how to estimate efficiency of algorithms. To improve our problem solving skills, we will also practice solving a few puzzles. You will have no puzzles on the exams, but they are important and integral part of the courses.

Among the well-known algorithms which use the same technique we will always choose to study those that are most frequently used in practice, in various fields, even if this requires a bit of extra work. For example, we will demonstrate the “divide and conquer” technique by studying the Fast Fourier Transform (FFT), which reigns in DSP (digital signal processing), in digital telecommunications and in countless other fields, such as finance. We will also study string-matching algorithms, which one can use to search for a particular gene on a piece of DNA.

Staff Contact details

Role	Name	Email	Office
Lecturer	Raveen de Silva	r.desilva@unsw.edu.au	K17 202
Course Admin	Anahita Namvar	cs3121@cse.unsw.edu.au	K17 501-04

Student Conduct

The **Student Code of Conduct** (Information (https://student.unsw.edu.au/conduct) , Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)) sets out what the University expects from students as members of the UNSW community. As well as the learning, teaching and research environment, the University aims to provide an environment that enables students to achieve their full potential and to provide an experience consistent with the University's values and guiding principles. A condition of enrolment is that students *inform themselves* of the University's rules and policies affecting them, and conduct themselves accordingly.

In particular, students have the responsibility to observe standards of equity and respect in dealing with every member of the University community. This applies to all activities on UNSW premises and all external activities related to study and research. This includes behaviour in person as well as behaviour on social media, for example Facebook groups set up for the purpose of discussing UNSW

courses or course work. Behaviour that is considered in breach of the Student Code Policy as discriminatory, sexually inappropriate, bullying, harassing, invading another's privacy or causing any person to fear for their personal safety is serious misconduct and can lead to severe penalties, including suspension or exclusion from UNSW.

If you have any concerns, you may raise them with your lecturer, or approach the School Ethics Officer (mailto:ethics-officer@cse.unsw.edu.au) , Grievance Officer (mailto:grievance-officer@cse.unsw.edu.au) , or one of the student representatives.

Plagiarism is defined as (https://student.unsw.edu.au/plagiarism) using the words or ideas of others and presenting them as your own. UNSW and CSE treat plagiarism as academic misconduct, which means that it carries penalties as severe as being excluded from further study at UNSW. There are several on-line sources to help you understand what plagiarism is and how it is dealt with at UNSW:

- Plagiarism and Academic Integrity (https://student.unsw.edu.au/plagiarism)
- UNSW Plagiarism Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

Make sure that you read and understand these. Ignorance is not accepted as an excuse for plagiarism. In particular, you are also responsible that your assignment files are not accessible by anyone but you by setting the correct permissions in your CSE directory and code repository, if using. Note also that plagiarism includes paying or asking another person to do a piece of work for you and then submitting it as your own work.

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.

If you haven't done so yet, please take the time to read the full text of

- UNSW's policy regarding academic honesty and plagiarism (https://student.unsw.edu.au/plagiarism)

The pages below describe the policies and procedures in more detail:

- Student Code Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)
- Student Misconduct Procedure (https://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)
- Plagiarism Policy Statement (https://www.gs.unsw.edu.au/policy/documents/plagiarismpolicy.pdf)
- Plagiarism Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

You should also read the following page which describes your rights and responsibilities in the CSE context:

    - Essential Advice for CSE Students (https://www.engineering.unsw.edu.au/computer-science-engineering/about-us/organisational-structure/student-services/policies/essential-advice-for-cse-students)

Course Assessment

You will have four assignments (no coding involved), approx bi-weekly and each worth 10% of your grade, plus an online final exam worth 60%.

Here are the weights:

Homework	40%
Final Exam	60%

Bonus points will be added for forum participation (no more than 5%). Please refer to the welcome announcement (https://edstem.org/au/courses/7055/discussion/581377) for more details.

Lectures

Time	Lecturer	Link
Wednesday 16:00 - 18:00	Raveen	https://youtube.com/playlist?list=PLVly8g0-6d_copJ0iA8bW9vCJz14TD0nh (https://youtube.com/playlist?list=PLVly8g0-6d_copJ0iA8bW9vCJz14TD0nh)
Friday 14:00 - 16:00	Raveen	https://youtube.com/playlist?list=PLVly8g0-6d_copJ0iA8bW9vCJz14TD0nh (https://youtube.com/playlist?list=PLVly8g0-6d_copJ0iA8bW9vCJz14TD0nh)

Consultations

Time	Consultant	Link
Thursday 12:00 - 13:00	Raveen	https://unsw.zoom.us/j/84869304383 (https://unsw.zoom.us/j/8486930383)
Friday 17:00 - 18:00	Raveen	https://unsw.zoom.us/j/84869304383 (https://unsw.zoom.us/j/8486930383)

Peer Tutorials (from Thursday week 1)

Time	Demonstrator	Link

Monday 11:00 - 12:00	Gerald	https://unsw.zoom.us/j/81463936975 (https://unsw.zoom.us/j/81463936975)
Monday 17:00 - 18:00	Ethan	https://unsw.zoom.us/j/81463936975 (https://unsw.zoom.us/j/81463936975)
Tuesday 11:00 - 12:00	Song	https://unsw.zoom.us/j/81463936975 (https://unsw.zoom.us/j/81463936975)
Tuesday 17:00 - 18:00	Even	https://unsw.zoom.us/j/81463936975 (https://unsw.zoom.us/j/81463936975)
Wednesday 11:00 - 12:00	Gerald	https://unsw.zoom.us/j/81463936975 (https://unsw.zoom.us/j/81463936975)
Thursday 11:00 - 12:00	Even	https://unsw.zoom.us/j/81463936975 (https://unsw.zoom.us/j/81463936975)
Thursday 17:00 - 18:00	Ethan	https://unsw.zoom.us/j/81463936975 (https://unsw.zoom.us/j/81463936975)
Friday 11:00 - 12:00	Song	https://unsw.zoom.us/j/81463936975 (https://unsw.zoom.us/j/81463936975)

Recordings of the lectures and consultations will be published on the UNSW Algorithm Design YouTube channel, in the same playlist (https://youtube.com/playlist?list=PLVly8g0-6d_copJ0iA8bW9vCJz14TD0nh) .

You can post questions at the Ed forum (join using this link (https://edstem.org/au/join/wExa8n)). regarding all the material covered in lectures or ask for clarifications on the tutorial problems. In addition to the peer tutorials, you will be provided written tutorial exercises with detailed solutions and you can ask for clarifications during office hours which will also be delivered via Zoom.

UNSW professional Zoom license should be able to handle several hundred students at a time.

Course Syllabus

Some of the topics to be covered in COMP3121/9101 include:

Introduction:

- Please review the basic material from Aleks's review manual (http://www.cse.unsw.edu.au/%7Ecs3121/Lectures/dataorg.pdf)

Algorithm Analysis:

- Proving correctness of algorithms
- Stable Matching Problem

Divide-And-Conquer Method:

- Asymptotic behavior, recurrences, summations, estimations
- Weighing coins
- The Master Theorem
- Applications of the master Theorem: Fast integer multiplication
- When should you trust asymptotic estimates?
- Multiplying polynomials and FFT

The Greedy Method:

- When greed pays off - foundations of the Greedy Method
- Activity Selection problem
- Discrete (0–1) Knapsack Problem
- File compression: Huffman Codes
- Directed acyclic graphs and topological sorting
- Dijkstra's algorithm
- Minimum spanning trees

Dynamic Programming Method:

- Longest Increasing Subsequence
- Making change
- Assembly line scheduling
- Multiplying chains of matrices
- Longest Common Subsequence
- Edit distance
- Bellman – Ford algorithm
- Floyd – Warshall algorithm

Network Flow Algorithms:

- Flow networks
- Ford – Fulkerson algorithm and more
- Applications including Maximum Bipartite Matching

String Matching Algorithms:

- “Naïve” string matching algorithm
- Rabin – Karp hashing algorithm
- String matching using finite automata

Linear Programming:

- Formulating linear programs
- Linear programming and integer linear programming

Intractable Problems and Approximation Algorithms:

- Feasibility of algorithms
- Polynomial Time problems, NP problems, intractable problems
- NP complete problems and NP hard problems
- Feasible reductions
- Approximate solutions using Greedy Method and DP

Practicing problem-solving while having fun:

- Assorted puzzles

Final Exam

The final exam will be held online. More details will be announced later.

Course Evaluation and Development

This course is evaluated each session using the myExperience system.

In the previous offering of this course, students expressed a desire for more peer-to-peer interaction.

Based on their comments, we will trial a peer tutorial in T3.

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Comments (/COMP3121/21T3/forums/search?forum_choice=resource/64064) (/COMP3121/21T3/forums/resource/64064)

There are no comments yet.