Course Outlines

COMPSCI 120 : Mathematics for Computer Science

Science

(15 POINTS)

Course Prescription

Basic mathematical tools and methods needed for computer science are introduced. Elementary mathematical skills for defining, analysing and reasoning with abstract objects used in programming are developed. Topics include integers and rational numbers, strings and sets, methods of proof (including induction), algorithms and functions, and elementary introductions to graphs, trees, counting and probability.

Course Overview

This course is a core part of the Computer Science major. It focuses on laying theoretical foundations of mathematics which are further developed in COMPSCI 220, COMPSCI 225, and more advanced courses on algorithms, machine learning, and theoretical computer science. COMPSCI 120 is centered around one "big" idea: namely, the idea of a mathematical proof. In mathematics, a proof is an argument to show that something is true. In this course, we look at how we prove statements in the fields of computer science, logic, combinatorics, and graph theory. To do this, COMPSCI 120 is going to have a slightly different feel than most other courses you have had. Specifically, we are going to focus as much on the way arguments are formed as on the solutions to the problems we are studying! This course is suitable for any student who is interested in the foundations of computer science, mathematics, and logic.

Course Requirements

Prerequisite: MATHS 102 or at least 13 credits in Mathematics at NCEA Level 3 or D in CIE A2 Mathematics or C in CIE AS Mathematics or 3 out of 7 in IB Mathematics Restriction: Cannot be taken with, or after, COMPSCI 225, MATHS 254, 255

Capabilities Developed in this Course

Capability 1: Disciplinary Knowledge and Practice

Capability 2: Critical Thinking

Capability 3: Solution Seeking

Capability 4: Communication and Engagement

Capability 5: Independence and Integrity

Learning Outcomes

By the end of this course, students will be able to:

1. Communicate mathematically. Students should be able to read and interpret basic mathematical symbols and notation (for example, standard terminology of numbers, sets, functions, strings, trees and graphs), and be capable of translating and communicating their own ideas into mathematical language. (Capability 1, 2 and 4)
2. Perform simple mathematical modelling. Students should be capable of translating simple real-life tasks into algorithms, and of describing the tasks in mathematical language and abstraction. In particular, students should be capable of using the language and ideas represented by sets, functions, strings, trees and graphs when modelling and studying real-life tasks. (Capability 3 and 5)
3. Use and apply counting and probability techniques. Students should be comfortable with basic ideas in probability and counting, and applying them in easy real-life settings (for example, counting arrangements of items, computing expectation of a discrete random variable). (Capability 4 and 5)
4. Critically analyse formal logic and perform elementary proofs, including inductive proofs: Students should be comfortable with elementary formal mathematical proof techniques and inductive reasoning, and be capable of using these to prove theorems, such as correctness of a simple algorithm. They should be able to formally determine validity of a logical statement, for example by truth tables. (Capability 1, 2, 3, 4 and 5)

Assessments

Assessment Type	Percentage	Classification
Assignments	20%	Individual Coursework
Quizzes	1%	Individual Coursework
Tutorials	9%	Group & Individual Coursework
Final Exam	50%	Individual Examination
Test	20%	Individual Test
5 types	100%	

Assessment Type	Learning Outcome Addressed			
	1	2	3	4

Assignments	✔	✔	✔	✔
Quizzes	✔			
Tutorials	✔	✔	✔	✔
Final Exam	✔	✔	✔	✔
Test	✔	✔	✔	✔

Tuākana

For more information and to find contact details for the Tuākana coordinator, please see https://www.auckland.ac.nz/en/science/study-with-us/maori-and-pacific-at-the-faculty/tuakana-programme.html

Key Topics

1. Integers, primes and divisibility, modular arithmetic.
2. Sets and strings.
3. Basics of combinatorics and probability.
4. Introduction to algorithms and their running time, functions, and limit techniques.
5. Introduction to graph theory.
6. Direct proofs, proof by cases, proof by contradiction, proof by construction, and proof by induction.

Workload Expectations

This course is a standard 15 point course and students are expected to spend **20 hours per week** involved in each 15 point course that they are enrolled in.

Delivery Mode

Campus Experience

Attendance is required at scheduled activities including labs to receive credit for components of the course. Lectures will be available as recordings. Other learning activities including tutorials will not be available as recordings.

The course will not include live online events including tutorials.
Attendance on campus is required for the test/exam.
The activities for the course are scheduled as a standard weekly timetable

Learning Resources

A coursebook containing the lecture notes will be available from Canvas.

Student Feedback

During the course Class Representatives in each class can take feedback to the staff responsible for the course and staff-student consultative committees.

At the end of the course students will be invited to give feedback on the course and teaching through a tool called SET or Qualtrics. The lecturers and course co-ordinators will consider all feedback.

Your feedback helps to improve the course and its delivery for all students.

Digital Resources

Course materials are made available in a learning and collaboration tool called Canvas which also includes reading lists and lecture recordings (where available).

Please remember that the recording of any class on a personal device requires the permission of the instructor.

Academic Integrity

The University of Auckland will not tolerate cheating, or assisting others to cheat, and views cheating in coursework as a serious academic offence. The work that a student submits for grading must be the student's own work, reflecting their learning. Where work from other sources is used, it must be properly acknowledged and referenced. This requirement also applies to sources on the internet. A student's assessed work may be reviewed against online source material using computerised detection mechanisms.

Copyright

Inclusive Learning

All students are asked to discuss any impairment related requirements privately, face to face and/or in written form with the course coordinator, lecturer or tutor.

Student Disability Services also provides support for students with a wide range of impairments, both visible and invisible, to succeed and excel at the University. For more information and contact details, please visit the Student Disability Services' website http://disability.auckland.ac.nz

Special Circumstances

If your ability to complete assessed coursework is affected by illness or other personal circumstances outside of your control, contact a member of teaching staff as soon as possible before the assessment is due.

If your personal circumstances significantly affect your performance, or preparation, for an exam or eligible written test, refer to the University's aegrotat or compassionate consideration page https://www.auckland.ac.nz/en/students/academic-information/exams-and-final-results/during-exams/aegrotat-and-compassionate-consideration.html.

This should be done as soon as possible and no later than seven days after the affected test or exam date.

Students who are approved to take this course remotely will have alternative arrangements made for all assessed components.

Learning Continuity

In the event of an unexpected disruption we undertake to maintain the continuity and standard of teaching and learning in all your courses throughout the year. If there are unexpected disruptions the University has contingency plans to ensure that access to your course continues and your assessment is fair, and not compromised. Some adjustments may need to be made in emergencies. You will be kept fully informed by your course co-ordinator, and if disruption occurs you should refer to the University Website for information about how to proceed.

Level 1: Delivered normally as specified in delivery mode
Level 2: You will not be required to attend in person. All teaching and assessment will have a remote option. The following activities will also have an on campus / in person option: [Lectures, tutorials, office hours]
Level 3 / 4: All teaching activities and assessments are delivered remotely

Student Charter and Responsibilities

The Student Charter assumes and acknowledges that students are active participants in the learning process and that they have responsibilities to the institution and the international community of scholars. The University expects that students will act at all times in a way that demonstrates respect for the rights of other students and staff so that the learning environment is both safe and productive. For further information visit Student Charter https://www.auckland.ac.nz/en/students/forms-policies-and-guidelines/student-policies-and-guidelines/student-charter.html.

Disclaimer

Elements of this outline may be subject to change. The latest information about the course will be available for enrolled students in Canvas.

In this course you may be asked to submit your coursework assessments digitally. The University reserves the right to conduct scheduled tests and examinations for this course online or through the use of computers or other electronic devices. Where tests or examinations are conducted online remote invigilation arrangements may be used. The final decision on the completion mode for a test or examination, and remote invigilation arrangements where applicable, will be advised to students at least 10 days prior to the scheduled date of the assessment, or in the case of an examination when the examination timetable is published.