

Unit Outline

COMP3002 Theoretical Foundations of Computer Science Semester 2, 2021

Unit study package code:	COMP3002
Mode of study:	Internal
Tuition pattern summary:	<p>Note: For any specific variations to this tuition pattern and for precise information refer to the Learning Activities section.</p> <p>Lecture: 1 x 2 Hours Weekly Workshop: 1 x 1 Hours Weekly</p> <p>This unit does not have a fieldwork component.</p>
Credit Value:	25.0
Pre-requisite units:	<p>1922 (v.0) Data Structures and Algorithms 120 or any previous version OR COMP1002 (v.0) Data Structures and Algorithms or any previous version AND</p> <p>12333 (v.0) Design and Analysis of Algorithms 300 or any previous version OR COMP3001 (v.0) Design and Analysis of Algorithms or any previous version</p>
Co-requisite units:	Nil
Anti-requisite units:	Nil
Result type:	Grade/Mark
Approved incidental fees:	Information about approved incidental fees can be obtained from our website. Visit fees.curtin.edu.au/incidental_fees.cfm for details.
Unit coordinator:	<p>Title: Dr</p> <p>Name: Hannes Herrmann</p> <p>Phone: 08 9266 3309</p> <p>Email: Hannes.Herrmann@curtin.edu.au</p> <p>Location: Building: 314 - Room: 343</p>
Teaching Staff:	

Administrative contact:	<p>Name: Michelle Cutinha</p> <p>Phone: 08 9266 7428</p> <p>Email: M.Cutinha@curtin.edu.au</p>
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Location: Building: 314 - Room: 340

Learning Management System: [Blackboard](https://lms.curtin.edu.au) (lms.curtin.edu.au)

Acknowledgement of Country

We respectfully acknowledge the Indigenous Elders, custodians, their descendants and kin of this land past and present. The [Centre for Aboriginal Studies](#) aspires to contribute to positive social change for Indigenous Australians through higher education and research.

Syllabus

Automata theory: deterministic and non-deterministic automata and conversions. Grammars: context free grammars, languages for grammars and Parse trees. Turing machines and abstractions of RAM. Decidability, reducibility P and PN classes. Time and space complexity. NP completeness.

Introduction







This unit is an introduction to the theoretical aspects of algorithm and program design. This includes automata and regular languages, as used in Linux regular expressions and compiler design. There is also an introduction to both computability and complexity theories. All of these topics are considered in depth for the digital Von Neumann architecture, although alternate computer architectures are also discussed.

The unit focusses on teaching the skills required to classify real-world problem into those that are easily doable, those that are difficult and those that cannot be done at all.







Unit Learning Outcomes

All graduates of Curtin University achieve a set of six Graduate Capabilities during their course of study. These inform an employer that, through your studies, you have acquired discipline knowledge and a range of other skills and capabilities which employers would value in a professional setting. Each unit in your course addresses the Graduate Capabilities through a clearly identified set of learning outcomes. They form a vital part in the process referred to as assurance of learning. The learning outcomes notify you of what you are expected to know, understand or be able to do in order to be successful in this unit. Each assessment for this unit is carefully designed to test your knowledge of one or more of the unit learning outcomes. On successfully completing all of the assessments you will have achieved all of these learning outcomes.

Your course has been designed so that on graduating you will have achieved all of Curtin's Graduate Capabilities through the assurance of learning processes in each unit.

On successful completion of this unit students can:		Graduate Capabilities addressed	
1	Synthesize finite automata, pushdown automata, context free grammars, and Turing machines with specific properties, and relate one form to another		
2	Apply recognisability and decidability concepts, and use the construction and mapping reducibility techniques to prove a problem decidable or undecidable		
3	Define and describe P, NP, and NP complete computation time problems, and explain their relationship and applications		

Curtin's Graduate Capabilities

	Apply discipline knowledge, principles and concepts		Innovative, creative and entrepreneurial		Effective communicators with digital competency
	Globally engaged and responsive		Culturally competent to engage respectfully with local First Peoples and other diverse cultures		Industry connected and career capable

Find out more about Curtin's Graduate Capabilities at the Curtin Learning and Teaching website: lt.curtin.edu.au

Learning Activities

Lectures are used as a means for introducing information, including examples, simulations and related references. They are also used as forums for discussion on the readings. Note that this class follows a 'flipped-classroom' teaching model, so you are required to do appropriate reading before each lecture session. Each lecture also starts with a quiz; these aren't worth marks but help to deepen your learning.

Tutorials are used for discussion of key concepts and reinforcements of methodology. Tutorials are the main place to discuss the weekly worksheets; you should always attempt a worksheet before the tutorial that covers it. You will be working in groups to tackle the problems, but having attempted them yourself will let your group focus on those problems you've found tough tackling individually.

Online learning and simulations are used to enhance the learning experience.

Learning Resources

Library Reading List

The Reading List for this unit can be accessed through Blackboard.

Essential texts

The required textbook(s) for this unit are:

- Sipser, M., 'Introduction to the Theory of Computation, 3rd Edition, 2012.

This is the main textbook. Readings from this textbook are a required part of the unit. Note that an electronic version of this book is available online, but make sure you get the correct version and that you obtain it legally. Some of the questions on worksheets will be from this book, and we will occasionally be referencing it in both lectures and tutorials.

To be clear - studying this book as part of the unit is essential but you may be able to get away without buying it. Certainly, buying it will make your life easier.

(ISBN/ISSN: 9781133187790)

Other resources

This unit will use the Finite State Machine Simulator at <http://curtinfsm.bitbucket.org/>.

Assessment

Assessment policy exemptions

- There are no exemptions to the assessment policy

Assessment schedule

	Task	Value %	Date Due	Unit Learning Outcome(s) Assessed	Late Assessments Accepted?*	Assessment Extensions Considered?*
1	Mid-semester Test	25%	Week: Week 6 Day: During the lecture period* Time: During the lecture period*	1	No	No
2	Assignment Based Test	25%	Week: Week 11 (Teaching Week 10) Day: During the lecture period* Time: During the lecture period*	1,2	No	No
3	Final Examination	50%	Week: During the exam period Day: During the exam period Time: During the exam period	1,2,3	No	Yes

*Please refer to the Late Assessment and the Assessment Extension sections below for specific details and conditions.

Detailed information on assessment tasks

- The first assignment will be available on Blackboard from the end of Week 1 of semester at the latest. This assignment will not be assessed, but the questions in this test relate directly to the assignment questions. Note that this does not mean that all questions in the test will be exactly identical to those on the assignment - although some will be - but that all questions in the test will be at the least far more easy to solve if the assignment questions have been solved correctly.
This test will be held in class at the start of the lecture period, venues permitting. The aim is to have a face to face test, however the class may decide to have vivas instead.
- The second assignment will be available on Blackboard from Week 6 of semester at the latest. This assignment will not be assessed, but the questions in this test relate directly to the assignment questions. Note that this does not mean that all questions in the test will be exactly identical to those on the assignment - although some will be - but that all questions in the test will be at the least far more easy to solve if the assignment questions have been solved correctly. Questions from or relating to the assignment will also appear in the exam.
This test will be held in class at the start of the lecture period, venues permitting. The aim is to have a face to face test but the class may decide to have a viva instead.
- The final exam will cover all parts of the unit except for the material on non-standard architectures covered in the final lecture. This exam will be based on the first two assignments as well as the third one. The third assignment will be made available on Blackboard by week 12 at the latest.

INote - Curtin has decided that there will be no inviolated exams due to COVID except those using the IRIS

software. Due to concerns about this I wanted to find a way to let students opt out of assessments using IRIS but was not allowed to do so. As such, this will be a verbal exam (viva) lasting 20 to 30 minutes. It will still be based directly on the assignment and be a fair bit more forgiving than pen-and-paper assessments.]

Pass requirements

Students must achieve a Final Mark of 50 or greater to pass this unit as well as achieving at least 40% in the final exam.

There are no delayed/early tests. If you fail to attend one of the tasks and submit a valid Request for Delayed Assessment form within the proper time limits and the request is accepted, you will not be allowed to sit the test at a later date. Instead you will be exempted from that assessment, meaning that any marks allocated to that assessment will instead be allocated to the final exam. The exam may be deferred, as usual.

Assessment Moderation

Fair assessment through moderation

Moderation describes a quality assurance process to ensure that assessments are appropriate to the learning outcomes, and that students work is evaluated consistently by assessors. Minimum standards for the moderation of assessments are described in the Assessment and Student Progression Manual, available from policies.curtin.edu.au/findapolicy/

Pre-marking moderation

This unit complies with moderation of assessments as described in the Assessment and Student Progression Manual, available from policies.curtin.edu.au/findapolicy/.

Intra-marking / Post-marking moderation

This unit complies with moderation of assessments as described in the Assessment and Student Progression Manual, available from policies.curtin.edu.au/findapolicy/.

Late assessment

Where the submission of a late assessment is permitted, late penalties will be consistently applied in this unit.

Where a late assessment **is** permitted for an assessment item or the entirety of the unit (refer to the Assessment Schedule table in this Unit Outline) and the student does not have an approved assessment extension:

1. For assessment items submitted within the first 24 hours after the due date/time, students will be penalised by a deduction of 5% of the total marks allocated for the assessment task;
2. For each additional 24 hour period commenced an additional penalty of 10% of the total marks allocated for the assessment item will be deducted; and
3. Assessment items submitted more than 168 hours late (7 calendar days) will receive a mark of zero.

Where late assessment **is NOT** permitted for an assessment item or the entirety of the unit (refer to the Assessment Schedule table in this Unit Outline) and the student does not have an approved assessment extension:

1. All assessment items submitted after the due date/time will receive a mark of zero.

Assessment extension

Where an application for an assessment extension **is** permitted for an assessment item(s) within this unit (refer to the Assessment Schedule table in this Unit Outline):

1. A student who is unable to complete an assessment item by/on the due date/time as a result of exceptional circumstances beyond the student's control, may apply for an assessment extension on the Assessment Extension Application Form as prescribed by the Academic Registrar. The form is available on the Forms page at <https://students.curtin.edu.au/essentials/forms-documents/forms/> and also within the student's OASIS (My Studies tab – Quick Forms) account.
2. The student will be expected to submit their application for an Assessment Extension with supporting documentation [via the online form](#).
3. Timely submission of this information supports the assessment process. For applications that are declined, delayed submission may have significant ramifications on the possible marks awarded.
4. An application may be accepted up to five working days after the due date/time of the assessment item where the student is able to provide a verifiable explanation as to why they were not able to submit the application prior to the assessment due date/time

Where an application for an assessment extension **is NOT** permitted for an assessment item(s) within this unit (refer to the Assessment Schedule table in this Unit Outline):

1. All assessment items submitted after the due date/time will be subject to late penalties or receive a mark of zero depending on the unit permitting late assessment submissions.

Deferred assessments

If your results show that you have been granted a deferred assessment you should immediately check OASIS for details.

Deferred examinations/tests will be held from 08/12/2021 to 17/12/2021 . Notification to students will be made after the Board of Examiners' meeting via the Official Communications Channel (OCC) in OASIS.

Further assessment

Further assessments, if granted by the Board of Examiners, will be held between 08/12/2021 and 17/12/2021 . Notification to students will be made after the Board of Examiners meeting via the Official Communications Channel in OASIS.

It is the responsibility of the student to be available to complete the requirements of a further assessment. If your results show that you have been granted a further assessment you should immediately check OASIS for details.

Reasonable adjustments for students with disabilities/health circumstances likely to impact on studies

A [Curtin Access Plan](#) (CAP) is a document that outlines the type and level of support required by a student with a disability or health condition to have equitable access to their studies at Curtin. Carers for people with disability may also be eligible for support. This support can include alternative exam or test arrangements, study materials in accessible formats, access to Curtin's facilities and services or other support as discussed with an advisor from [AccessAbility Services](#).

Documentation is required from your treating Health Professional to confirm your health circumstances or carer responsibilities.

If you think you may be eligible for a CAP, please contact AccessAbility Services. If you already have a CAP please provide it to the Unit Coordinator in week 1 of each study period.

Referencing style

The referencing style for this unit is Vancouver.

More information can be found on this style from the Library web site:

<https://libguides.library.curtin.edu.au/uniskills/referencing/vancouver>.

Privacy

As part of a learning or assessment activity, or class participation, your image or voice may be recorded or transmitted by equipment and systems operated by Curtin University. Transmission may be to other venues on campus or to others both in Australia and overseas.

Your image or voice may also be recorded by students on personal equipment for individual or group study or assessment purposes. Such recordings may not be reproduced or uploaded to a publicly accessible web environment. If you wish to make such recordings for study purposes as a courtesy you should always seek the permission of those who are impacted by the recording.

Recording of classes or course materials may not be exchanged or distributed for commercial purposes, for compensation, or for any other purpose other than personal study for the enrolled students in the unit. Breach of this may subject a student to disciplinary action under Statute No 10 – Student Disciplinary Statute.

If you wish to discuss this please talk to your Unit Coordinator.

Copyright

The course material for this unit is provided to you for your own research and study only. It is subject to copyright. It is a copyright infringement to make this material available on third party websites.

Academic Integrity (including plagiarism and cheating)

Academic Integrity

Curtin's [Student Charter](#), [Academic Integrity Program \(AIP\)](#), and core [Values](#) guide expectations regarding student behaviour and responsibilities. Information on these topics can be found on the [Student Essentials Website](#) or the Academic Integrity tab in Blackboard.

Academic Integrity Warnings

An Academic Integrity Warning may be issued to a New-to-Curtin student if they have inadequately acknowledged sources or collaborated inappropriately. [The Management of Academic Integrity Warnings for New to Curtin Students Procedures](#) provide further information and explain who is considered to be New-to-Curtin.

Academic Misconduct

Students with an academic breach that do not meet the New-to-Curtin criteria will be managed through the misconduct process. [Academic Misconduct](#) means conduct by a student that is dishonest or unfair in connection with any academic work. This includes all types of plagiarism, cheating, collusion, falsification or fabrication of data or other content, and Academic Misconduct Other, such as falsifying medical certificates for extension. More details can be found on the [Student Essentials Website](#) or on the [Academic Integrity Website](#).

Staff members are required to report suspected misconduct and an inquiry may take place. If misconduct is determined it will result in penalties, which may include a warning, a reduced or nil grade, a requirement to repeat the assessment, an annulled grade (ANN) or termination from the course. Some penalties may impact on future enrolment.

Academic work under inquiry will not be graded until the process has concluded. If your work is the subject of an inquiry you will be notified by email and Official Communication with an opportunity to respond. Appropriate support will be provided. For more information refer to [Statute No.10 Student Discipline and Academic Misconduct Rules](#).

Information and Communications Technology (ICT) Expectations

Curtin students are expected to have reliable internet access in order to connect to OASIS email and learning systems such as Blackboard and Library Services.

You may also require a computer or mobile device for preparing and submitting your work.

For general ICT assistance, in the first instance please contact OASIS Student Support:

oasisapps.curtin.edu.au/help/general/support.cfm

For specific assistance with any of the items listed below, please contact The Learning Centre:

life.curtin.edu.au/learning-support/learning_centre.htm

- Using Blackboard, the I Drive and Back-Up files
- Introduction to PowerPoint, Word and Excel

Additional information

Enrolment

It is your responsibility to ensure that your enrolment is correct - you can check your enrolment through the eStudent option on OASIS, where you can also print an Enrolment Advice.

Student Rights and Responsibilities

It is the responsibility of every student to be aware of all relevant legislation, policies and procedures relating to their rights and responsibilities as a student. These include:

- the Student Charter
- Values and Signature Behaviours
- the University's policy and statements on plagiarism and academic integrity
- copyright principles and responsibilities
- the University's policies on appropriate use of software and computer facilities

Information on all of the above is available through the University's "Student Rights and Responsibilities" website at: students.curtin.edu.au/rights.

Student Equity


There are a number of factors that might disadvantage some students from participating in their studies or assessments to the best of their ability, under standard conditions. These factors may include a disability or medical condition (e.g. mental illness, chronic illness, physical or sensory disability, learning disability), significant caring responsibilities, pregnancy, religious practices, living in a remote location, or another reason. If you believe you may be unfairly disadvantaged on these or other grounds please contact the appropriate service below. It is important to note that the staff of the University may not be able to meet your needs if they are not informed of your individual circumstances, so please get in touch with the appropriate service if you require assistance.

To discuss your needs in relation to:

- Disability or medical conditions, contact AccessAbility Services: <https://students.curtin.edu.au/personal-support/disability/>
- Elite athletes, contact Elite Athlete Coordinator: <https://stadium.curtin.edu.au/sport/academy/elite-athlete-program/>
- All other grounds, contact the Student Wellbeing Advisory Service: <https://students.curtin.edu.au/personal-support/counselling-guidance/wellbeing/>

Recent unit changes

Students are encouraged to provide unit feedback through **eVALUate**, Curtin's online student feedback system. For more information about **eVALUate**, please refer to evaluate.curtin.edu.au/info/.

	To view previous student feedback about this unit, search for the Unit Summary Report at https://evaluate.curtin.edu.au/student/unit_search.cfm . See https://evaluate.curtin.edu.au/info/dates.cfm to find out when you can eVALUate this unit.
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Recent changes to this unit include:

2016

Added in-lecture quizzes to provide better feedback on student progress.

2017

The pre-requisite of DAA has been introduced for the MSc version of this unit, to make it match the UG version. Hopefully this will prevent some of the previous issues.

2018

Trying to change how tutorials are handled based on student feedback. Changing all tests to assignment tests, also based on student feedback.

2019

Tutorials still being worked on.

2020

No changes (I was busy).

Program calendar

Week	Begin Date	Module	Topic	Sipser
0.	19 July	Orientation Week		
1.	26 July	1 – Automata and Languages	DFA	0, 1.1
2.	2 August		NFA	1.2
3.	9 August		Regular Languages, Pumping Lemma	1.3, 1.4
4.	16 August		Context-free languages, Push-Down Automata	2.1, 2.2, 2.3
5.	23 August	2 – Computability Theory	Turing machines, The Church-Turing thesis	3
6.	30 August	Assignment Test 1		
7.	6 September	Tuition Free Week		
8.	13 September		Decidability	4
9.	20 September		Reducibility	5
10.	27 September	3 – Complexity Theory	Time complexity, P and NP	7.1 – 7.3
11.	4 October	Assignment Test 2		
12.	11 October		NP-Complete	7.4 – 7.5
13.	18 October	Other Computing Models		
14.	25 October	Study Week		