



# COMP6300

## Applied Cryptography

Session 1, Weekday attendance, North Ryde 2020

*Department of Computing*

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## General Information

Unit convenor and teaching staff

Convenor and Lecturer

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Lecturer

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Credit points

10

Prerequisites

Corequisites

Co-badged status

COMP2300

Unit description

This unit provides an introduction to modern applied cryptography. It deals with the concepts and techniques behind cryptographic primitives, such as hash functions, symmetric-key ciphers, public-key cryptography and digital signatures. It then explains the concept of cryptanalysis before addressing important cryptographic protocols. The unit concludes with a review of existing applications including blockchain and cryptocurrencies, electronic voting schemes, executable code signing, full disk encryption, etc.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** Explain the concepts and principles on which modern cryptography relies upon.

**ULO2:** Employ adapted cryptographic tools and techniques to encrypt, decrypt and sign

messages.

**ULO3:** Decipher simple encrypted messages using a range of cryptanalysis methods.

**ULO4:** Apply cryptographic technologies and protocols to increase data security and protect privacy.

## Assessment Tasks

### Coronavirus (COVID-19) Update

Assessment details are no longer provided here as a result of changes due to the Coronavirus (COVID-19) pandemic.

Students should consult [iLearn](#) for revised unit information.

[Find out more about the Coronavirus \(COVID-19\) and potential impacts on staff and students](#)

## General Assessment Information

### Late Submission

No extensions will be granted without an approved application for Special Consideration. There will be a deduction of 10% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late. For example, 25 hours late in submission for an assignment worth 10 marks – 20% penalty or 2 marks deducted from the total. No submission will be accepted after solutions have been posted.

### Supplementary Exam

If you receive Special Consideration for the final exam, a supplementary exam will be scheduled after the normal exam period, following the release of marks. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

## Delivery and Resources

### Coronavirus (COVID-19) Update

Any references to on-campus delivery below may no longer be relevant due to COVID-19.

Please check here for updated delivery information: [https://ask.mq.edu.au/account/pub/display/unit\\_status](https://ask.mq.edu.au/account/pub/display/unit_status)

## COMPUTING FACILITIES

**Important!** Please note that this is a BYOD (Bring Your Own Device) unit. You will be expected

to bring your own laptop computer (Windows, Mac or Linux) to the workshop, install and configure the required software, and incorporate secure practices into your daily work (and play!) routines.

## CLASSES

Each week you should complete any assigned readings and review the lecture slides in order to prepare for the lecture. There are three hours of lectures and a one-hour workshop every week. There uses hands-on exercises to reinforce concepts introduced during the lectures; you should have chosen a practical on enrollment. You will find it helpful to read the workshop instructions before attending - that way, you can get to work quickly!

For details of days, times and rooms consult the [timetables webpage](#).

Note that **Workshops commence in week 1**.

You should have selected a practical at enrollment.

Please note that you will be **required** to submit work every week. Failure to do so may result in you failing the unit or being excluded from the exam.

## DISCUSSION BOARDS

This unit makes use of discussion boards hosted within iLearn . Please post questions there; they are monitored by the staff on the unit.

## REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

Required readings for this unit:

- N. Smart, **Cryptography Made Simple**, Springer. The book is available online at <http://www.springer.com/us/book/9783319219356>
- R. Anderson, **Security Engineering (SE)** Wiley Publishing, Inc. 2008. The complete second edition is now available online at <http://www.cl.cam.ac.uk/~rja14/book.html>

Recommended readings for this unit:

- A. J. Menezes, P. C. van Oorschot and S. A. Vanstone, **Handbook of applied cryptography (HAC)**, CRC Press, Boca Raton, FL, 1996. All required chapters are available online at <http://cacr.uwaterloo.ca/hac/>
- **NIST SP 800** documents available from <http://csrc.nist.gov/publications/PubsSPs.html>
- **IETF RFC's** available from <http://www.rfc-editor.org>
- Bauer, Craig P., **Secret History: The Story of Cryptology**, CRC Press (2013)
- Cryptography Engineering: Design Principles and Practical Applications, Ferguson, Neils, Tadayoshi Kohno and Bruce Schneier, 1st ed., Wiley

# TECHNOLOGY USED AND REQUIRED

## iLearn

[iLearn](#) is a Learning Management System that gives you access to lecture slides, lecture recordings, forums, assessment tasks, instructions for practicals, discussion forums and other resources.

## Echo 360 (formerly known as iLecture)

Digital recordings of lectures are available. Read these [instructions](#) for details.

## Technology Used

Java or C++ programming language and GP/PARI, GnuPG, VeraCrypt, Thunderbird, Gnu Privacy Guard, Enigmail, OpenSSH, PuTTY, Ophcrack.

# Unit Schedule

### Coronavirus (COVID-19) Update

The unit schedule/topics and any references to on-campus delivery below may no longer be relevant due to COVID-19. Please consult [iLearn](#) for latest details, and check here for updated delivery information: [https://ask.mq.edu.au/account/pub/display/unit\\_status](https://ask.mq.edu.au/account/pub/display/unit_status)

Week	Topic	Reading
1	Introduction to Cryptography and Elementary Number Theory	Lecture Slides
2	Security Definitions and Modern Symmetric Ciphers 1	Lecture Slides
3	Modern Symmetric Ciphers 2	Lecture Slides
4	Cryptographic Hash Functions	Lecture Slides
5	Introduction to Public Key Cryptography and Advanced Number Theory	Lecture Slides
6	RSA Cryptosystem	Lecture Slides
7	ElGamal Cryptosystem and Elliptic Curve Cryptography	Lecture Slides
8	Digital Signatures	Lecture Slides
9	Cryptographic Protocols 1	Lecture Slides
10	Cryptographic Protocols 2	Lecture Slides
11	Advanced Cryptosystems (Lattice-based Cryptography)	Lecture Slides
12	Advanced Cryptographic Protocols (Zero-knowledge Protocols)	Lecture Slides
13	Revision and Exam Preparation	Lecture Slides

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](https://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Grading Standards

At the end of the semester, you will receive a grade that reflects your achievement in the unit

- **Fail (F):** does not provide evidence of attainment of all learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; and incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.
- **Pass (P):** provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; and communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
- **Credit (Cr):** provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of

substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; plus communication of ideas fluently and clearly in terms of the conventions of the discipline.

- **Distinction (D)**: provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.
- **High Distinction (HD)**: provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application.

Your final grade depends on your performance in each assessment task.

For each task, you receive a mark that reflects your standard of performance. Then the different component marks are added up to determine an aggregated mark out of 100. In order to pass the unit, this aggregated mark needs to be at least 50.

Note that assignment submission in this unit is not a hurdle requirement. However, if you do not make a reasonable attempt at the two assignments, you will be unlikely to pass the unit.

Your final grade is then a direct reflection of the aggregated mark according to the following:

- 85-100 for **HD**
- 75-84 for **D**
- 65-74 for **CR**
- 50-64 for **P**

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn ([bit.ly/FSESupp](https://unitguides.mq.edu.au/unit_offerings/122754/unit_guide/print)) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

If you are given a second opportunity to sit the final examination as a result of failing to meet the minimum mark required, you will be offered that chance during the same supplementary examination period and will be notified of the exact day and time after the publication of final results for the unit.



# Learning and Teaching Activities

## Lectures

The lectures are the primary activity for this unit. While the lecture notes or slides will be available on iLearn, a lot of supporting detail and explanation is presented in the lectures, so skipping them is inadvisable.

## Workshops

The practicals provide opportunities for hands-on learning in three primary areas: low-level programming skills, the number theory which underlies public-key cryptography and the practical application of security technologies such as file and disk encryption as well as the exchange of signed and encrypted emails. Important! Please note that this is a BYOD (Bring Your Own Device) unit. You will be expected to bring your own laptop computer (Windows, Mac or Linux) to the Tutorial/Practicals, install and configure the required software, and incorporate secure practices into your daily work (and play!) routines.