

<https://courseoutline.auckland.ac.nz/dco/course/COMPSCI/215/1213>

COMPSCI 215 : Data Communications and Security

Science

2021 Semester One (1213) (15 POINTS)

Course Prescription

An introduction to data communications: the OSI reference model, particularly how the lower layers combine to implement the application layer. An introduction to secure communication and computer systems.

Course Overview

This course consists of a networking and a security part. The networking part introduces the basics of networking with the TCP/IP protocol stack in networks with switches and routers and familiarises students with the fundamental concepts that underpin it: layered communication, encapsulation and packet forwarding based on address. It also introduces students to network partitioning and topology. The security part introduces various aspects of encryption to secure communication between parties. It familiarises students with the fundamentals of classic cryptography, and how confidentiality and integrity are realised in shared-key and public-key cryptosystems.

This course is of interest to those who would like to explore the fields of computer networks and digital security.

Course Requirements

Prerequisite: COMPSCI 110 and PHYSICS 140 and 15 points from COMPSCI 105, 107, 130

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

Capability 6: Social and Environmental Responsibilities

Graduate Profile: [Bachelor of Science](#)

Learning Outcomes

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

1. Identify and describe the layers and their purpose in a standard communication system. (Capability 1 and 2)
2. Work with IP version 4 addresses and netmasks in a context of subnetting and IP datagram forwarding. (Capability 1, 2 and 3)
3. Analyse and construct TCP/IP networks with switches and routers. (Capability 1, 2, 3, 4 and 5)
4. Describe and explain the concept of encapsulation in layered communication. (Capability 1, 2 and 3)
5. Describe and explain the operation of ARP and DHCP. (Capability 1)
6. Identify and analyse classic encrypted communication. (Capability 1, 2 and 3)
7. Critically evaluate shared-key cryptosystems (Capability 1, 2, 3, 4 and 6)
8. Critically evaluate public-key cryptosystems (Capability 1, 2, 3, 4 and 6)
9. Explain how various concepts in digital security come together to form the transport layer security protocol. (Capability 1, 2, 3 and 4)
10. Critically evaluate the trade-off between performance and security (Capability 1, 2 and 3)

Assessments

| Assessment Type | Percentage | Classification |
|-----------------|------------|------------------------|
| Assignments | 30% | Individual Coursework |
| Test | 15% | Individual Test |
| Test | 15% | Individual Test |
| Final Exam | 40% | Individual Examination |
| 4 types | 100% | |

| Assessment Type | Learning Outcome Addressed | | | | | | | | | |
|-----------------|----------------------------|---|---|---|---|---|---|---|---|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Assignments | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Test | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | |
| Test | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Final Exam | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Tuākana

This course is supported by the Computer Science Tuākana programme (<https://canvas.auckland.ac.nz/courses/34081>). Contact the course coordinator for details.

Key Topics

Components of physical networks, switches, routers, layered communication, protocols, the OSI stack, the TCP/IP stack, MAC addresses, IPv4 addressing, IPv4 netmasks, IP subnetting, CIDR notation, ARP, DHCP, IP forwarding, transport protocols, UDP, TCP, packet loss, sequence numbers and acknowledgments.

Classic cryptography . Shared-key cryptosystems and message integrity. Secure exchange of secret keys. Public-key cryptosystems and message integrity. Introduction to HTTP and HTTP security. HTTP latencies and performance. Transport layer security — HTTPS. Additional topics such as Steganography.

Special Requirements

None.

Workload Expectations

This course is a standard 15 point course and students are expected to spend 10 hours per week involved in each 15 point course that they are enrolled in.

Per week, you can expect 3 hours understanding lecture content, 3 hours of reading and individual learning on the week's topics, and 4 hours of work on assignments and/or test preparation.

The course has weekly assignments spanning key topics covered during the week.

Delivery Mode

Campus Experience

Attendance is encouraged at scheduled activities including lectures and tutorials.

Lectures will be available as recordings. Other learning activities including tutorials may not be available as recordings.

Attendance on campus is required for the tests and final examination.

The activities for the course are scheduled as a standard weekly timetable.

Learning Resources

There is no prescribed text book. Online resources for additional reading will be provided with each lecture topic.

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.

Sharing assignment solutions and source code does not help learning. Consequently, our academic integrity policy does not permit sharing of solutions or source code leading to solutions, nor does it allow sourcing solutions or source code from any third party. Violation of this will result in your assignment submission attracting no marks, and you may face further disciplinary action. Therefore, please do not share assignments, assignment solutions and/or source code leading to assignment solutions, or use material from others in your assignments. You must not publish assignments or solutions in any form online at any time. There are also copyright and IP issues. Please come talk to us if you have any doubt over what is legitimate and what is not. You can refer to online tutorials and resources. However, please learn from them and implement the solutions yourself based on what you learnt from those sources. Do not blindly copy from online sources.

Don't leave your computers, devices, and belongings unattended — you must secure these at all times to prevent anyone having access to your assignments or solutions. If others are found to have used your assignments or solutions, you will also face disciplinary action.

Copyright

The content and delivery of content in this course are protected by copyright. Material belonging to others may have been used in this course and copied by and solely for the educational purposes of the University under license.

You may copy the course content for the purposes of private study or research, but you may not upload onto any third party site, make a further copy or sell, alter or further reproduce or distribute any part of the course content to another person.

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) <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) <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.

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.

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) <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.