



## UNSW Course Outline

# TELE3118 Network Technologies - 2024

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## General Course Information

**Course Code :** TELE3118

**Year :** 2024

**Term :** Term 3

**Teaching Period :** T3

**Is a multi-term course? :** No

**Faculty :** Faculty of Engineering

**Academic Unit :** School of Electrical Engineering & Telecommunications

**Delivery Mode :** In Person

**Delivery Format :** Standard

**Delivery Location :** Kensington

**Campus :** Sydney

**Study Level :** Postgraduate, Undergraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

This is an introductory course about computer networks. You will learn about the basic principles of computer networks, for example, packet switching, layering, encapsulation, and protocols; you will learn how applications such as the world-wide-web, video streaming (e.g., YouTube and

Netflix), video conferencing (e.g., Skype and Zoom) and BitTorrent use the network to communicate. You will spend quite a lot of time learning about the specifics of how the Internet works. You will learn how applications communicate reliably over an unreliable Internet.

Specific topics are as follows. Network architectures in terms of topology, role (client/server, peer-to-peer), and layered specification. Packet and circuit switching. Physical characteristics of network transmission links. Medium access control protocols for wired links (e.g., Ethernet) and wireless links (e.g., 802.11). Protocols for error and flow control and their link layer application. Interconnection of networks using bridges, switches, and routers. Routing techniques, including Dijkstra's algorithm, distance vector, and link state routing. Addressing and naming. Network congestion control. End-to-end protocols for matching applications to networks, including TCP and UDP. Network applications, such as web (HTTP), email (SMTP, POP, IMAP), and streaming media (e.g., video, VOIP).

## Course Aims

This course aims to develop a fundamental understanding of the architecture of communication networks such as the Internet. It will introduce students to the layered communication protocol stack (referred to as the TCP/IP stack in the Internet context), and progressively work through the functions and technologies at the various layers. Topics covered will include the physical medium, medium access mechanisms, IP addressing and routing, TCP congestion control, and applications such as the web, streaming media, and DNS.

# Course Learning Outcomes

Course Learning Outcomes
CL01 : Describe the role of layers in the architecture of a communication system
CL02 : Evaluate medium access mechanisms suitable to different physical media
CL03 : Design simple data networks by constructing appropriate IP addresses and routes
CL04 : Analyse mechanisms for reliability and congestion-control in the Internet
CL05 : Recognise the steps by which applications such as the web operate
CL06 : Construct client-server applications that operate over the Internet

Course Learning Outcomes	Assessment Item
CL01 : Describe the role of layers in the architecture of a communication system	<ul style="list-style-type: none"><li>• Labs</li><li>• Project</li><li>• Mid-Term Exam</li><li>• Final Exam</li></ul>
CL02 : Evaluate medium access mechanisms suitable to different physical media	<ul style="list-style-type: none"><li>• Labs</li><li>• Mid-Term Exam</li><li>• Final Exam</li></ul>
CL03 : Design simple data networks by constructing appropriate IP addresses and routes	<ul style="list-style-type: none"><li>• Labs</li><li>• Mid-Term Exam</li><li>• Final Exam</li></ul>
CL04 : Analyse mechanisms for reliability and congestion-control in the Internet	<ul style="list-style-type: none"><li>• Labs</li><li>• Final Exam</li></ul>
CL05 : Recognise the steps by which applications such as the web operate	<ul style="list-style-type: none"><li>• Project</li><li>• Labs</li><li>• Final Exam</li></ul>
CL06 : Construct client-server applications that operate over the Internet	<ul style="list-style-type: none"><li>• Project</li><li>• Labs</li><li>• Final Exam</li></ul>

## Learning and Teaching Technologies

Moodle - Learning Management System

## Other Professional Outcomes

Engineers Australia (EA), Professional Engineer Stage 1 Competencies

The Course Learning Outcomes (CLOs) contribute to your development of the following EA competencies:

**PE1: Knowledge and Skill Base:**

PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals: CLO 1, 2, 3, 4, 5, 6

PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing: CLO 1, 2, 3, 4, 5, 6

PE1.3 In-depth understanding of specialist bodies of knowledge: CLO 1, 2, 3, 4, 5, 6

PE1.4 Discernment of knowledge development and research directions: n/a

PE1.5 Knowledge of engineering design practice: CLO 1, 2, 3, 4, 6

PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice: n/a

**PE2: Engineering Application Ability:**

PE2.1 Application of established engineering methods to complex problem solving: CLO 1, 2, 3, 4, 5, 6

PE2.2 Fluent application of engineering techniques, tools and resources: CLO 1, 2, 3, 4, 5, 6

PE2.3 Application of systematic engineering synthesis and design processes: n/a

PE2.4 Application of systematic approaches to the conduct and management of engineering projects: n/a

**PE3: Professional and Personal Attributes:**

PE3.1 Ethical conduct and professional accountability: n/a

PE3.2 Effective oral and written communication (professional and lay domains): n/a

PE3.3 Creative, innovative and pro-active demeanour: CLO 3, 6

PE3.4 Professional use and management of information: CLO 3, 6

PE3.5 Orderly management of self, and professional conduct: n/a

PE3.6 Effective team membership and team leadership: CLO 3, 6

**Targeted Graduate Capabilities:**

Electrical Engineering and Telecommunications programs are designed to address the following targeted capabilities, which were developed by the school in conjunction with the requirements of professional and industry bodies:

- The ability to apply knowledge of basic science and fundamental technologies;
- The skills to communicate effectively, not only with engineers but also with the wider community;
- The capability to undertake challenging analysis and design problems and find optimal solutions;

- Expertise in decomposing a problem into its constituent parts and in defining the scope of each part;
- Working knowledge of how to locate required information and use information resources to their maximum advantage;
- Proficiency in developing and implementing project plans, investigating alternative solutions, and critically evaluating differing strategies;
- An understanding of the social, cultural, and global responsibilities of the professional engineer;
- The ability to work effectively as an individual or in a team;
- An understanding of professional and ethical responsibilities;
- The ability to engage in lifelong independent and reflective learning.

### **UNSW Graduate Capabilities:**

The course delivery methods and course content directly or indirectly address a number of core UNSW graduate capabilities, as follows:

- Developing scholars who have a deep understanding of their discipline through lectures and solutions to analytical problems in tutorials and assessed by assignments and written examinations.
- Developing rigorous analysis, critique, and reflection, and the ability to apply knowledge and skills to solving problems. These will be achieved by laboratory experiments and interactive checkpoint assessments, and lab exams during the labs.
- Developing capable independent and collaborative enquiry through a series of tutorials spanning the duration of the course.
- Developing digital and information literacy and lifelong learning skills through assignment work.
- Developing independent, self-directed professionals who are enterprising, innovative, creative, and responsive to change through challenging design and project tasks.

<https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>

## **Additional Course Information**

### **Credits:**

This is a 6 UoC course, and the expected workload is 15 hours per week throughout the 10-week term. It includes lectures, laboratories, and tutorials. Supervised labs are held 3 hours per week; however, you will be expected to work on the project outside designated lab hours.

### **Relationship to Other Courses:**

This is a 3rd-year undergraduate course in the School of Electrical Engineering and Telecommunications. It is a core course for students following a BE (Telecommunications)

program and other combined degree programs, and an elective for the BE (Electrical) program.

### **Pre-requisites and Assumed Knowledge:**

The pre-requisites for this course include DESN2000, ELEC2141, and COMP1511 or COMP1521. They provide useful background about digital circuits, embedded systems, interfacing to hardware, operating systems, and programming skills, which are crucial for network technologies.

### **Following Courses:**

This course provides an introduction to data networking and establishes the foundation for subsequent courses such as TELE3119 “Trusted Networks” which covers the security aspects of data networks, TELE4123 “Telecomms Design Proficiency”, and TELE4642 “Network Performance” which studies tools and techniques for analysing the performance of data networks. Postgraduate courses that delve deeper into these topics include TELE9751 Switching Systems Design (about the internal operation of network devices such as routers and switches), TELE9752 Network Operations and Control (about managing and running networks), GSOE9758 Network Systems Architecture, and TELE9756 Advanced Networking (about selected network research topics). The course is a pre-requisite for

- Trusted Networks - TELE3119
- Network Performance - TELE4642
- Telecomms Design Proficiency - TELE4123

### **Workload:**

It is expected that you will spend at least 15 hours per week studying a 6 UoC course, from Week 1 until the final assessment, including both online classes and independent, self-directed study. In periods where you need to complete assignments or prepare for examinations, the workload may be greater. Over-commitment has been a common source of failure for many students. You should take the required workload into account when planning how to balance study with employment and other activities.

### **Attendance:**

Regular and punctual attendance at all classes is expected. UNSW regulations state that if students attend less than 80% of scheduled classes, they may be refused final assessment.

## General Conduct and Behaviour:

Consideration and respect for the needs of your fellow students and teaching staff is an expectation. Conduct which unduly disrupts or interferes with a class is not acceptable, and students may be asked to leave the class.

# Assessments

## Assessment Structure

Assessment Item	Weight	Relevant Dates
Labs Assessment Format: Individual Short Extension: Yes (7 days)	20%	Start Date: Not Applicable Due Date: Not Applicable
Project Assessment Format: Individual Short Extension: Yes (7 days)	10%	Start Date: Not Applicable Due Date: Not Applicable
Mid-Term Exam Assessment Format: Individual Short Extension: Yes (7 days)	30%	Start Date: 11/10/2024 02:00 PM Due Date: 11/10/2024 04:00 PM
Final Exam Assessment Format: Individual	40%	Start Date: Not Applicable Due Date: Not Applicable

## Assessment Details

### Labs

#### Assessment Overview

In-lab experiments will provide hands-on experience with networking technologies. You are required to prepare beforehand by reading the handouts posted on the course web page. They will stress the applicability of the course material to the real world. They will provide first-hand observation of and experimentation with the technologies used on the Internet. Lab experiments are equally weighted. Marks for each lab session will be available to students by the next lab session.

Assessment marks will be awarded according to your preparation (completing set preparation exercises and correctness of these or readiness for the lab in terms of pre-reading), how much of the lab you were able to complete, your understanding of the experiments conducted during the lab, the quality of the code you write during your lab work, and your understanding of the topic covered by the lab.

### Course Learning Outcomes

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- CL06 : Construct client-server applications that operate over the Internet

### Assignment submission Turnitin type

Not Applicable

### Generative AI Permission Level

**No Assistance**

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

## **Project**

### Assessment Overview

The project will provide you with the opportunity to design and demonstrate a real Internet application. You will be expected to work on your programming assignment outside of designated lab hours, either on your own computing equipment or using the computer labs in the School, and you will have to demonstrate your working software during week 10. The project will be marked according to the degree to which it meets the specifications. The project must be "submitted" by demonstrating its working and explaining the source code to markers in your allocated marking session, which will be stated on the course web page.

### Course Learning Outcomes

- CL01 : Describe the role of layers in the architecture of a communication system
- CL05 : Recognise the steps by which applications such as the web operate
- CL06 : Construct client-server applications that operate over the Internet

### Assignment submission Turnitin type

Not Applicable

### Generative AI Permission Level

**No Assistance**



This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

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## Mid-Term Exam

### Assessment Overview

The mid-term exam, held in week 5 and covering topics covered in weeks 1 to 4, is intended to give you timely feedback about your performance. Marks will be assigned according to the correctness of the responses. Class-wide feedback will be verbally given during a later lecture session.

### Course Learning Outcomes

- CL01 : Describe the role of layers in the architecture of a communication system
- CL02 : Evaluate medium access mechanisms suitable to different physical media
- CL03 : Design simple data networks by constructing appropriate IP addresses and routes

### Assessment Length

120 minutes

### Assignment submission Turnitin type

Not Applicable

### Generative AI Permission Level

**No Assistance**

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

## Final Exam

### Assessment Overview

The final exam will provide a final test of competency and will cover all the topics taught in the course. Marks will be assigned according to the correctness of the responses.

### Course Learning Outcomes

- CL01 : Describe the role of layers in the architecture of a communication system
- CL02 : Evaluate medium access mechanisms suitable to different physical media

- CL03 : Design simple data networks by constructing appropriate IP addresses and routes
- CL04 : Analyse mechanisms for reliability and congestion-control in the Internet
- CL05 : Recognise the steps by which applications such as the web operate
- CL06 : Construct client-server applications that operate over the Internet

#### Assessment Length

120 minutes

#### Assignment submission Turnitin type

Not Applicable

#### Generative AI Permission Level

**No Assistance**

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

## General Assessment Information

#### Assessment requirements:

Material submitted for assessment must:

- Be submitted before the deadline. Late submissions will be penalised, potentially by receiving a mark of 0.
- Be original work by the student and not involve plagiarism. Students who have been found to have plagiarised in a TELE3118 assessment item may have the maximum number of marks for that assessment item subtracted from their overall course mark, e.g., 10% if you have been found to have plagiarised in your project.
- Be self-contained in that it can be fully understood independent of course materials (e.g., lecture notes)
- Demonstrate skills and understanding of knowledge that are covered by the course.

#### Grading Basis

Standard

#### Requirements to pass course

N/A

# Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Physical Layer; Data Link Layer: Framing and Errors, MAC
Week 2 : 16 September - 22 September	Lecture	Data Link Layer: Wireless and Ethernet; Switching
	Laboratory	Lab 1: Cabling
Week 3 : 23 September - 29 September	Lecture	Network Layer Data Plane: Basics, Addressing; Routers
	Laboratory	Lab 1: Cabling
Week 4 : 30 September - 6 October	Lecture	Network Layer Data Plane: Forwarding; IPv6, SDN
	Laboratory	Lab 2: Switching
Week 5 : 7 October - 13 October	Lecture	Network Layer Control Plane: IGP Routing; BGP Routing; SDN and SNMP; Mid-Term Test (Friday 11 Oct, 2-4pm)
	Laboratory	Lab 3: IP and ICMP
Week 6 : 14 October - 20 October	Lecture	Flexibility Week – Revision discussions and activities
Week 7 : 21 October - 27 October	Lecture	Transport Layer: Basics, UDP and TCP
	Laboratory	Lab 4: Routing
Week 8 : 28 October - 3 November	Lecture	Transport Layer: TCP congestion control; TCP fairness
	Laboratory	Lab 5: TCP
Week 9 : 4 November - 10 November	Lecture	Application Layer: Basics, HTTP; SMTP, P2P
Week 10 : 11 November - 17 November	Lecture	Application Layer: DNS and CDNs; Review
	Laboratory	Lab 6: Mini-Project

## Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

## Course Resources

### Prescribed Resources

Course resources including lecture notes, lab guides, tutorials will be available on the course web page: <https://subjects.ee.unsw.edu.au/tele3118/>

### Recommended Resources

The recommended book for this course is by [James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach](#), Global edition (7e), Pearson, 2017.

As an additional reference we will also be using the book by Andrew S. Tanenbaum and David J. Wetherall, [Computer Networks](#), 5th edition, Pearson, 2011.

# Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Hassan Habibi Gharakheili		Room 417, EE building (G17)	+61 (2) 9385 5176		Yes	Yes

## Other Useful Information

### Academic Information

#### I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

#### II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)
- [Equitable Learning Services](#)

#### III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable

Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

#### **IV. Professional Outcomes and Program Design**

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: <https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>.

*Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.*

#### **Academic Honesty and Plagiarism**

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW 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.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: [student.unsw.edu.au/plagiarism](https://student.unsw.edu.au/plagiarism). The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures

can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

[www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf](http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)

## Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

## Faculty-specific Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries e.g. admissions, fees, programs, credit transfer

## Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

## School-specific Information

### General Conduct and Behaviour

Consideration and respect for the needs of your fellow students and teaching staff is an expectation. Conduct which unduly disrupts or interferes with a class is not acceptable and students may be asked to leave the class.

### Use of AI for assessments

Your work must be your own. If you use AI in the writing of your assessment, you must acknowledge this and your submission must be substantially your own work. More information can be found on this [website](#).

### Workplace Health & Safety (WHS)

WHS for students and staff is of utmost priority. Most courses involve laboratory work. You must follow the [rules about conduct in the laboratory](#). About COVID-19, advice can be found on this [website](#).

## School Contact Information

**Consultations:** Lecturer consultation times will be advised during the first lecture. You are welcome to email the tutor or laboratory demonstrator, who can answer your questions on this course and can also provide you with consultation times. ALL email enquiries should be made from your student email address with ELEC/TELExxxx in the subject line; otherwise they will not be answered.

**Keeping Informed:** Announcements may be made during classes, via email (to your student email address) and/or via online learning and teaching platforms – in this course, we will use Moodle <https://moodle.telt.unsw.edu.au/login/index.php>. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

## **Student Support Enquiries**

[For enrolment and progression enquiries please contact Student Services](#)

## **Web**

[Electrical Engineering Homepage](#)