TELE3119
Trusted Networks
Course Outline – Term 3, 2022

Course Staff

Course Convener:	Prof. Aruna Seneviratne, EE Building 307
Tutor:	Prof. Aruna Seneviratne, EE Building 307
Laboratory Demonstrator:	Junye Li

Consultations

You are encouraged to ask questions about the course material, before or after the lectures. Lecturer consultation times will be *Monday 1300-1500*. You are welcome to email the laboratory demonstrator, who can answer your questions on laboratories and can provide you with consultation times during the designated laboratory times if he has. All email enquiries should be made from your **UNSW student email** address with "TELE3119" in the **subject line**, otherwise, they may not be answered.

Keeping Informed

Announcements may be made during classes, via email (to your student email address) and/or via the online platform Microsoft Teams. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

Course Summary

Contact Hours

The course consists of lectures, tutorials, and Laboratory sessions every week (starting from week 2) as shown in the table below.

	Day	Time	Location
Lectures	Monday (1-3, 5-10)	1600 - 1800	CivEng 101
	Friday	0900 - 1100	Webst ThA
Lab	*Begin Week 2*		
	Wednesday	1500-1800	Online
Tutorials	*Begins Week 2*		
	Friday	1200-1300	ElecEng206
	Friday	1400-1500	ElecEng206

Context and Aims

This course is for 6 Units of Credit and is aimed at Undergraduate Engineers wishing to understand security issues in communication networks. This course is designed to provide an integrated focus on security-related aspects of networking, as a core competency for telecommunications engineers. More specifically, the course is intrinsically linked to the concepts, protocols, and networking fundamentals developed in Tele3118 and TELE4642. The networking issues covered in Tele3118/Tele4642 are re-analysed from the standpoint of trust, authentication, integrity, and security. Understanding the principles underlying trust and security in modern telecommunication networks is considered a paramount networking skill. As such, this course is core for all Telecommunication students.

Indicative Lecture Schedule

Period	Summary of Lecture Program
Week 1 12/09	Basics of Cryptography 1 • Overview, Crypto Systems, Private Key: Product and Block Ciphers
Week 2 19/09	Basics of Cryptography 2 • Asymmetric Encryption, Diffie Hellman Key Exchange, Public Key • Infrastructure: MACs, HASH Functions
Week 3 26/09	Cryptography Infrastructure • Digital Signatures, Pretty Good Privacy, Public Key Infrastructure *Material to be examined in Class Quiz 1 in Week 4* Applications 1 • Blockchains
Week 4 03/10	**Class Quiz 1** Applications 2 • Blockchains cont. • Crypto Currencies: Bitcoin and Etherium
Week 5 10/10	Applications 2: • End-to-End Protocols – Signals • Internet Privacy TOR
Week 6 17/10	*Flexibility Week*
Week 7 24/10	**Class Quiz 2** Securing Communications 1 • TLS/SSL, IPSec
Week 8 31/10	Securing Communications 2: • Wireless Local Area Networks (WEP/WPA)

Week 9 07/11	Securing Networked Systems • Firewall, Intrusion Detection Systems, VPNs Types of Attacks
Week 10 14/11	Attacking Networked Systems Data Exfiltration & Side Channel Attacks

Indicative Laboratory Schedule

Period	Summary of Laboratory Program
Week 1	No Labs
Week 2	Lab setup and Testing
Week 3-4	Lab 1: Packet Analysis and Manipulation
Week 5	Lab 2: Detailed Wireshark Analysis
Week 6	*Flexibility Week*
Week 7	Lab 3: Using Nmap
Week 8-9	Lab 4: Scapy, Nmap Emulator & DOS Attack
Week 10	Lab Oral Exam

Assessment

Laboratory Practical Experiments	30%
Class Quiz1 & 2 (15% each)	30%
Final Exam (2 hours)	40%

Pass in the Final Exam is a mandatory requirement to pass the course

Course Details

This is a 6 UoC course and the expected workload is 15 hours per week throughout the 10-week term. It includes lectures and laboratories. However, you will be expected to work on laboratory projects outside of designated lab hours.

Relationship to Other Courses

This is a 4th-year undergraduate elective course in the School of Electrical Engineering and Telecommunications. It may also be taken by postgraduate students.

Course Objectives & Learning Outcomes

At the end of the course students should:
1. Understand the theory, concepts, and challenges of encryption protocols
2. Understand the theory, concepts, and challenges of authentication protocols
3. A practical understanding of how applications operate over communication networks
4. Understand key objectives in designing and analyzing a secured network
5. Be able to design and simulate the behaviour of security in communication networks
6. Design secure and trusted network applications, and design web-based applications running over the Secure Sockets Layer
7. Design network authentication systems and possess the ability to analyze network traffic from a security standpoint.

Relation to other courses:

This course is related to another communication course offered by Electrical Engineering in that it builds on concepts and principles introduced in TELE3118. More specifically, the course is intrinsically linked to the concepts, protocols, and networking fundamentals developed in TELE3118. The networking issues covered in TELE3118 are re-analysed from the standpoint of trust, authentication, integrity, and security.

Graduate Attributes:

This course will impact the following graduate attributes
1. Development of skills involved in scholarly enquiry
2. Capacity for analytical and critical thinking and creative problem-solving
3. The ability to engage in independent and reflective learning
4. Information literacy - the skills to appropriately locate, evaluate, and use relevant information

Teaching Strategies

Delivery Mode

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Lectures – to give the basic material, discuss the intuition behind the mathematics, and learn to incorporate rigour in the solution process.
- Tutorials – to learn problem-solving techniques, employ critical thinking, and reflect and discuss alternative techniques.
- Labs – laboratory assignments will provide hands-on experience of network security and an opportunity for constructing and evaluating practical tools.
- Project – will use group work as a means of exploring a research problem in greater depth, and provide you with the opportunity to demonstrate and communicate your approach and solution.
- Quizzes – will provide feedback on your progress in problem-solving.
- Final examination – final test of competency.

Learning in this course

You are expected to attend <u>all</u> lectures, labs, and quizzes to maximise learning. You must prepare well for your laboratory classes and your lab work will be assessed. In addition to the lecture notes, you should read relevant sections of the recommended text. Reading additional texts will further enhance your learning experience. Group learning is also encouraged. UNSW *assumes* that self-directed study of this kind is undertaken in addition to attending face-to-face classes throughout the course.

Laboratory Program

The laboratories are designed to provide practical, hands-on exposure to the concepts conveyed in lectures. You are required to attend laboratory sessions every week starting from Week2.

Laboratory Exemption

<u>There is no laboratory exemption for this course</u>. Regardless of whether equivalent labs have been completed in previous courses, all students enrolled in this course must take the labs. If for medical reasons, (note that a valid medical certificate must be provided) you are unable to attend a lab, you will need to apply for a catch-up lab during another lab time, as agreed by the laboratory coordinator.

Assessment

The assessment scheme in this course reflects the intention to assess your learning progress through the semester. Ongoing assessment occurs through the lab checkpoints (see lab manual), lab exams and the mid-semester exam.

Quizzes

This course will have two in-class written quizzes that will evaluate and provide feedback on your understanding of the material in this course. Quiz 1 will be held in week 4 (Monday), and quiz 2 in week 9 (Monday). Each quiz is worth 15% of the final grade, and each will typically test your problem-solving skills. Re-tests will not be granted if a student misses the test unless satisfactory written evidence is presented of adverse conditions that prevented the student from taking the test. In such a case, the course convener may at his sole discretion conduct the re-test orally (instead of or in addition to a written component) individually with the student, within two weeks of the original test date

Final Exam

The exam in this course is a standard closed-book 2 hour written examination. University approved calculators are allowed. The examination tests analytical and critical thinking and a general understanding of the course material in a controlled fashion. Questions may be drawn from any aspect of the course (including laboratory) unless specifically indicated otherwise by the lecturer. Marks will be assigned according to the correctness of the responses.

Pass in the Final Exam is a mandatory requirement to pass the course

Relationship of Assessment Methods to Learning Outcomes

Assessment	Learning outcomes						
	1	2	3	4	5	6	7
Laboratory practical assessments1	✓	✓	✓	-	-	-	-
Class Quiz 1	✓	✓	✓	-	-	-	-
Laboratory practical assessments1	-	-	✓	✓	✓	-	-
Class Quiz 2	-	-	✓	✓	✓	-	-
Laboratory Project	-	-	-	-	✓	✓	✓
Final exam	✓	✓	✓	✓	✓	✓	✓

Course Resources Textbooks

The class will not follow one textbook but will consist of material taken from various sources, including textbooks, online material, and other literature.

Additional reference material and papers will be detailed in class.

Other Matters

Academic Honesty and Plagiarism

Plagiarism is the unacknowledged use of other people's work, including the copying of assignment works and laboratory results from other students. Plagiarism is considered a form of academic misconduct, and the University has very strict rules that include some severe penalties. For UNSW policies, penalties and information to help you avoid plagiarism, see http://www.lc.unsw.edu.au/academic-integrity-plagiarism. To find out if you

understand plagiarism correctly, try this short quiz: https://student.unsw.edu.au/plagiarism-quiz.

Student Responsibilities and Conduct

Students are expected to be familiar with and adhere to all UNSW policies (see https://my.unsw.edu.au/student/atoz/ABC.html), and particular attention is drawn to the following:

Workload

It is expected that you will spend at least *ten to twelve hours per week* studying a 6 UoC course, from Week 1 until the final assessment, including both face-to-face classes and *independent, self-directed study*. In periods where you need to 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.

Work Health and Safety

UNSW Policy requires each person to work safely and responsibly, to avoid personal injury and to protect the safety of other

Special Consideration and Supplementary Examinations

You must submit all assignments and attend all examinations scheduled for your course. You should seek assistance early if you suffer illness or misadventure which affects your course progress. All applications for special consideration must be **lodged online through myUNSW within 3 working days of the assessment**, not to course or school staff. For more detail, consult https://student.unsw.edu.au/special-consideration.

Continual Course Improvement

This course is under constant revision to improve the learning outcomes for all students. Based on feedback from past years we will endeavour to provide more support for the programming aspects of the lab work. Please forward any feedback (positive or negative) on the course to the course convener or via the online student survey MyExperience. As a result of previous feedback obtained for this course and in our efforts to provide a rich and meaningful learning experience, we have continued to evaluate and modify our delivery and assessment methods.

Administrative Matters

On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the School and UNSW policies:

https://www.engineering.unsw.edu.au/electrical-engineering/resources/undergraduate-resources/policies-and-procedures
https://my.unsw.edu.au/student/atoz/ABC.html