

TELE9756

Advanced Networking

Term 3, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Robert Malaney	r.malaney@unsw.edu.au	Wednesday 4-7pm	R407	029385658 0

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](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

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)

Email

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, 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

Course Details

Units of Credit 6

Summary of the Course

This course provides an overview of key telecommunication technologies likely to be deployed in the future. The course will focus on emerging concepts around 6G networks. We will pay particular attention to the following technologies - all of which will likely play an important role in 6G systems: wireless network location; advanced wireless networking control; integration of optical communications; and next-generation security.

Course Aims

The main aim of this course is to develop amongst students from different backgrounds a solid understanding of the key concepts and principles that underpin the exciting new world of advanced communications, such as 6G and next-generation optical communications. The course introduces the key concepts important for understanding, testing, analysing and improving the performance of advanced communication networks. It will have a focus on the use of location information as an enabler of next-generation communications. Designed from an engineering perspective the course will first introduce the basic mathematics and physical principles that underlies location information gathering in wireless networks. It will then introduce and explore the use of that information in various case-use applications within the context of emerging advanced communication networks. Integration of optical communications and advanced security techniques, such as quantum cryptography will be introduced.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Explain the theory, concepts, and challenges of advanced communications	PE1.1, PE2.3
2. Explain the theory of obtaining location information over a wireless network	PE1.2, PE1.3
3. Explain how applications operate over advanced communication systems	PE2.1, PE1.5
4. Carry out calculations that determine the performance of an advanced network	PE2.2, PE1.2
5. Review and communicate via written reports the novelty and usefulness of relevant communication research papers	PE3.2, PE3.4

Teaching Strategies

Delivery Mode- This course will be run in hybrid mode, meaning the formal lectures will be live in a classroom **and** simultaneously online. You are not required to be physically present for the live lesson if you cannot be there. The course may revert to being just available online. In any case the lectures will

be live online Wednesday 4pm-7pm. Students attending live are encouraged to bring their own laptop to class.

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

- **Formal lectures**, which provide you with a focus on the core analytical material in the course, together with qualitative, alternative explanations to aid your understanding.
- **Tutorials** will be done in class, which allow for exercises in problem solving and allow time for you to resolve problems in understanding of lecture material.
- **An online quiz** will be provided each week to assess your understanding of the class material. Each quiz can may be taken at any time and are not assessed (not compulsory).

Learning in this course:

You are expected to attend (either virtually or physically) all lectures, and mid-term exams in order to maximise learning. You must prepare well for your classes. In addition to the lecture notes/video, you should read relevant sections of the recommended materials. 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 formal classes throughout the course.

Additional Course Information

Course Resources

Due to the varied and advanced nature of this course, there is no one specific text for this course - rather you will be pointed to relevant texts available via the UNSW online library, or freely available in the research literature. These will be pointed out to you as the course material is covered each week

On-line resources

Moodle

As a part of the teaching component, Moodle will be used to disseminate teaching materials, host forums and occasionally quizzes. Assessment marks will also be made available via Moodle:

<https://moodle.telt.unsw.edu.au/login/index.php>.

Mailing list

Announcements concerning course information will be given in the lectures and/or on Moodle and/or via email (which will be sent to your student email address).

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Assignment:	20%	27/11/2022 12:00 AM	1, 2, 3, 5
2. Mid-term exam	20%	Week 6	1, 2, 3, 4
3. Final Exam	60%	Not Applicable	1, 2, 3, 4

Assessment 1: Assignment:

Start date: 12/10/2022 12:00 AM

Submission notes: via Moodle

Due date: 27/11/2022 12:00 AM

Deadline for absolute fail: 11.59pm Sunday at end of Week 11.

Marks returned: Prior to Final Exam

The assignment allows self-directed study leading to the solution of partly structured problems. It will be based on a coding of specific use case to be described more in class. You may use any programming language (e.g, C, C++, Java, Python) you wish, or any programming environment (e.g, Matlab) you wish. You will provide a short report for this assignment. Marks will be assigned according to how completely and correctly the problems have been addressed, the quality of the code written for the assignment (must be attached to the report, and the understanding of the course material demonstrated by the report. The assignment will be done on a group (max 3) basis. The assignment report will be due end of Week 11. Late reports will attract a penalty of 10% per day (including weekends).

Assessment criteria

Develop professional code for the problem that is fully functional (full marks) - or partially functional (pass mark).

Provide a written report written to professional standard that fully explains the operation and functionality of the code (full marks) - or partially explain the operation of the code (pass marks)

Provide a written report written to professional standards that fully explains purpose of the assignment detailing what problem is being solved, its importance to 6 G networks, and your view on how successful the shown techniques is (full marks) - or partially explains the above characteristics (pass marks)

Assessment criteria with marking rubric

Criteria	Fail	Pass	Credit	Distinction	High distinction
Code Development	Poor functionality	Minimum functionality	Basic functionality	Most functionality	All functionality
Report Writing	Substandard Professional Writing (poor	Basic Standard of Professional	Good Standard of Professional	High Standard of Professional Writing	Exceptional Standard of Professional

	grammar, poor logical flow, poor explanation of code and it aims, poor presentation, poor conclusion).	Writing	Writing		Writing
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Assessment 2: Mid-term exam

Assessment length: 2 hours

Due date: Week 6

Marks returned: 20/10/2022

The mid-term examination tests your general understanding of the course material, and is designed to give you feedback on your progress through the analytical components of the course. Questions may be drawn from any material already covered in the course schedule. It may contain questions requiring some (not extensive) knowledge of assigned reading material and will definitely contain numerical and analytical questions. Marks will be assigned according to the correctness of the responses.

Assessment criteria

Multiple Choice: Full marks for all answered correctly - pass marks for 50% answered correctly

Additional details

This is a multiple choice exam - fail, pass, credit, DN and HD as per usual UNSW requirements.

Assessment 3: Final Exam

Assessment length: 2 hours

Marks returned: School to advise

Final Examination

The exam in this course is a two-hour written examination, comprising five compulsory questions. University approved calculators are allowed. The examination tests analytical and critical thinking and general understanding of the course material in a controlled fashion. Questions may be drawn from any aspect of the course, (unless specifically indicated otherwise by the lecturer. Marks will be assigned according to the correctness of the responses. Please note that you must pass the final exam in order to pass the course.

Attendance Requirements

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

Course Schedule

All classes will be online as well as being live (Hybrid mode), 4pm-7pm Wednesday, Weeks 1 through 10.

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 12 September - 16 September		
	Lecture	Introductory Lecture - Introduction to Advanced Networks: 6G, and Optical, and Security
Week 2: 19 September - 23 September	Lecture	Determining a Location within a Wireless Network
Week 3: 26 September - 30 September	Lecture	Higher Layer Advanced Networking Techniques
Week 4: 3 October - 7 October	Lecture	Optical Communications in Advanced Networks
Week 5: 10 October - 14 October	Lecture	Consolidation week
Week 6: 17 October - 21 October	Lecture	Review of the story so far
	Assessment	Mid-term exam
Week 7: 24 October - 28 October	Lecture	Integrating Wireless and Optical Networks within 6G Systems.
Week 8: 31 October - 4 November	Lecture	Short introduction to basic ideas in advanced security techniques - quantum cryptography
Week 9: 7 November - 11 November	Lecture	Applications in Advanced Networks
Week 10: 14 November - 18 November	Lecture	Review Lecture

Resources

Prescribed Resources

On-line resources

Moodle

As a part of the teaching component, Moodle will be used to disseminate teaching materials, host forums and occasionally quizzes. Assessment marks will also be made available via Moodle:

<https://moodle.telt.unsw.edu.au/login/index.php>.

Mailing list

Announcements concerning course information will be given in the lectures and/or on Moodle and/or via email (which will be sent to your student email address).

Main Text: No Main text for this course. Online material relevant to each lecture will be posted as course progresses.

[All required material will be available free online via a UNSW Library Account]

Recommended Resources

Course Evaluation and Development

This course is under constant revision in order to improve the learning outcomes for all students. Please forward any feedback (positive or negative) on the course to the course convener or via the myExperience process. You can also provide feedback to ELSOC who will raise your concerns at student focus group meetings. 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.

Based on feedback from previous year, additional in class tutorial material has been added to this year's course.

Laboratory Workshop Information

No laboratory work is required.

Academic Honesty and Plagiarism

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 <https://student.unsw.edu.au/plagiarism>. To find out if you understand plagiarism correctly, try this short quiz: <https://student.unsw.edu.au/plagiarism-quiz>.

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.

Academic Information

COVID19 - Important Health Related Notice

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by [NSW health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#). **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed.

If you are required to self-isolate and/or need emotional or financial support, please contact the [Nucleus: Student Hub](#). If you are unable to complete an assessment, or attend a class with an attendance or participation requirement, please let your teacher know and apply for [special consideration](#) through the [Special Consideration portal](#). To advise the University of a positive COVID-19 test result or if you suspect you have COVID-19 and are being tested, please fill in this [form](#).

UNSW requires all staff and students to follow NSW Health advice. Any failure to act in accordance with that advice may amount to a breach of the Student Code of Conduct. Please refer to the [Safe Return to Campus](#) guide for students for more information on safe practices.

Dates to note

Important Dates available at: <https://student.unsw.edu.au/dates>

Student Responsibilities and Conduct

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

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 formal 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.

Work Health and Safety

UNSW policy requires each person to work safely and responsibly, in order to avoid personal injury and to protect the safety of others.

Special Consideration and Supplementary Examinations

You must submit all assignments and attend all examinations scheduled for your course. You can apply for special consideration when illness or other circumstances beyond your control interfere with an assessment performance. If you need to submit an application for special consideration for an exam or assessment, you must submit the application **prior to the start** of the exam or before the assessment is submitted, except where illness or misadventure prevent you from doing so. Be aware of the “fit to sit/submit” rule which means that if you sit an exam or submit an assignment, you are declaring yourself well enough to do so and cannot later apply for Special Consideration. For more information and how to apply, see <https://student.unsw.edu.au/special-consideration>.

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://student.unsw.edu.au/guide>

<https://www.engineering.unsw.edu.au/electrical-engineering/resources>

Disclaimer

This Course Outline sets out 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 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 (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

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CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	