TELE9756 Advanced Networking - 2024

Published on the 25 Aug 2024

General Course Information

Course Code : TELE9756
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
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course provides advanced knowledge of telecommunication networks currently being deployed or likely to be deployed in the future. It focus will be on material drawn from the recent research literature with a particular focus in the following three areas: network-to-network

interface issues related to quality of service and reliability; cross-layer optimization issues related to network efficiency; and the control and management of mobility in networks.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Explain the theory, concepts, and challenges of advanced communications
CLO2 : Explain the theory of obtaining location information over a wireless network
CLO3 : Explain how applications operate over advanced communication systems
CLO4 : Carry out calculations that determine the performance of an advanced network
CLO5 : Review and communicate via written reports the novelty and usefulness of relevant communication research papers

Course Learning Outcomes	Assessment Item
CLO1 : Explain the theory, concepts, and challenges of advanced communications	• Mid term • Final Exam • Assignment
CLO2 : Explain the theory of obtaining location information over a wireless network	• Mid term • Final Exam • Assignment
CLO3 : Explain how applications operate over advanced communication systems	• Mid term • Final Exam • Assignment
CLO4 : Carry out calculations that determine the performance of an advanced network	• Mid term • Final Exam
CLO5 : Review and communicate via written reports the novelty and usefulness of relevant communication research papers	• Assignment

Learning and Teaching Technologies

Moodle - Learning Management System

Other Professional Outcomes

Relationship to Engineers Australia Stage 1 competencies:

The Course Learning Outcomes (CLOs) contribute to the Engineers Australia (National Accreditation Body) Stage I competencies as outlined below

Engineers Australia (EA), Professional Engineer Stage 1 Competencies

PE1: Knowledge and Skill Base:

PE1.1 Comprehensive, theory-based **understanding of underpinning fundamentals**: CLO 1

PE1.2 Conceptual understanding of underpinning maths, **analysis**, statistics, **computing**: CLO 2, 4

PE1.3 In-depth understanding of specialist bodies of **knowledge**: CLO 2

PE1.4 Discernment of knowledge development and research directions: NA

PE1.5 Knowledge of **engineering design** practice: CLO 3

PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice: NA

PE2: Engineering Application Ability:

PE2.1 Application of established engineering methods to **complex problem solving**: CLO 3

PE2.2 Fluent **application of engineering techniques**, tools and resources: CLO 4

PE2.3 Application of systematic engineering synthesis and design processes: CLO 1

PE2.4 Application of systematic approaches to the conduct and management of engineering projects: NA

PE3: Professional and Personal Attributes:

PE3.1 Ethical conduct and professional accountability: CLO 4

PE3.2 Effective **oral and written communication** (professional and lay domains): CLO 5

PE3.3 **Creative, innovative** and pro-active demeanour: CLO 3, 4

PE3.4 Professional use and management of information: NA

PE3.5 Orderly management of **self, and professional conduct**: CLO 5

PE3.6 Effective team membership and team leadership: NA

This course is also designed to provide the course learning outcomes which arise from targeted graduate capabilities. The targeted graduate capabilities broadly support the UNSW and Faculty of Engineering graduate capabilities (also listed below).

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;
- A 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 addresses a number of core UNSW graduate capabilities, as follows:

- Developing scholars who have a deep understanding of their discipline, through lectures and solution of analytical problems in tutorials and assessed by assignments and written examinations.
- Developing rigorous analysis, critique, and reflection, and ability to apply knowledge and skills to solving problems. These will be achieved by the 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 independent, self-directed professionals who are enterprising, innovative, creative and responsive to change, through challenging design and project tasks.
- Developing citizens who can apply their discipline in other contexts, are culturally aware and environmentally responsible, through interdisciplinary tasks, seminars and group activities

Additional Course Information

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.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Mid term Assessment Format: Individual	20%	
Final Exam Assessment Format: Individual	60%	
Assignment Assessment Format: Individual	20%	

Assessment Details

Mid term

Assessment Overview

Mid term Exam

Course Learning Outcomes

- CLO1 : Explain the theory, concepts, and challenges of advanced communications
- CLO2 : Explain the theory of obtaining location information over a wireless network
- CLO3 : Explain how applications operate over advanced communication systems
- CLO4 : Carry out calculations that determine the performance of an advanced network

Detailed Assessment Description

Assessment length: 2 hours

Due date: Week 6

Marks returned: TBA

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.

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

Final Examination

Course Learning Outcomes

- CLO1 : Explain the theory, concepts, and challenges of advanced communications
- CLO2 : Explain the theory of obtaining location information over a wireless network
- CLO3 : Explain how applications operate over advanced communication systems
- CLO4 : Carry out calculations that determine the performance of an advanced network

Detailed Assessment Description

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.

Hurdle rules

Please note that you must pass the final exam in order to pass the course.

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.

Assignment

Assessment Overview

A coding or simulation project related to a specific topic from the class material. This component comprises written 10 page report.

Course Learning Outcomes

- CLO1 : Explain the theory, concepts, and challenges of advanced communications
- CLO2 : Explain the theory of obtaining location information over a wireless network
- CLO3 : Explain how applications operate over advanced communication systems
- CLO5 : Review and communicate via written reports the novelty and usefulness of relevant communication research papers

Detailed Assessment Description

Assessment 1: Assignment:

Start date: TBA

Submission notes: via Moodle

Due date: TBA

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 information

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 grammar, poor logical flow, poor explanation of code and its aims, poor presentation, poor conclusion).	Basic Standard of Professional Writing	Good Standard of Professional Writing	High Standard of Professional Writing	Exceptional Standard of Professional Writing

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

Please note all assessments are compulsory.

Grading Basis

Standard

Requirements to pass course

You must pass the final exam in order to pass the course.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 0 : 2 September - 8 September	Online Activity	Enrol online
Week 1 : 9 September - 15 September	Lecture	Introductory Lecture - Introduction to Advanced Networks: 6G, Optical, and Security
Week 2 : 16 September - 22 September	Lecture	Determining a Location within a Wireless Network
Week 3 : 23 September - 29 September	Lecture	Higher Layer Advanced Networking Techniques
Week 4 : 30 September - 6 October	Lecture	Optical Communications in Advanced Networks
Week 5 : 7 October - 13 October	Lecture	Consolidation week
Week 6 : 14 October - 20 October	Lecture	Review of the story so far
	Assessment	Mid-term exam
Week 7 : 21 October - 27 October	Lecture	Integrating Wireless and Optical Networks within 6G Systems.
Week 8 : 28 October - 3 November	Lecture	Short introduction to basic ideas in advanced security techniques - quantum ctypotgraphy
Week 9 : 4 November - 10 November	Lecture	Applications in Advanced Networks
Week 10 : 11 November - 17 November	Lecture	Review Lecture

Attendance Requirements

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

Course 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 vailable free onlne 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 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.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Robert Malaney					No	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 polices. 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 convener 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 Plagarism

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. 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

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