UNSW Course Outline

TELE9782 Special Topics in Telecommunications 2 - 2024

Published on the 25 May 2024

General Course Information

Course Code : TELE9782
Year : 2024
Term : Term 2
Teaching Period : T2
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 is an elective course at the graduate level, covering some special or advanced topics in telecommunications of particular interests or needs at the time. The course content varies with the changing topics.

Course Aims

The course aims to expose students to some selected topics of special interest such as new emerging areas of technological advances or industry practices in the field of telecommunications.

Relationship to Other Courses

The course is a fourth-year professional elective offered to students following a BE (TELE and ELEC) course at UNSW. The course gives the foundations for antenna and propagation.

Assumed Knowledge

It is assumed that the student have a good knowledge of Electromgantics, ELEC3115 or equivalent course. Students who are not confident in their knowledge from Electromagnetic Engineering are strongly advised to revise Part B: Wave electromagnetics course materials as quickly as possible to avoid difficulties in this course.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : After successful completion of this course, students will gain a sound technical knowledge of the specific advanced telecommunications topics covered in this course.

Course Learning Outcomes	Assessment Item
CLO1 : After successful completion of this course, students will gain a sound technical knowledge of the specific advanced telecommunications topics covered in this course.	• Final Result

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

Consultations: You are encouraged to ask questions on the course material, during the lectures. If required, all email enquiries should be made from your student email address with TELE9782 in the subject line; otherwise they will not be answered.

Keeping Informed: Most announcements will be made via Moodle. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

Other Professional Outcomes

After successful completion of this course, you should be able to:

1. Define and describe the fundamental parameters and Figure-of-Merit of antennas.
2. Calculate and compare the radiation pattern of electric and magnetic dipole.
3. Study and analyse the effect of ground plane on the antenna performance.
4. Design and analyse a linear array of N elements with specific required beam pattern and directivity.
5. Design and analyse a metallic waveguide and transform it into a horn antenna.
6. Design and analyse narrowband and broadband antennas and future communication systems.

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 1

PE1.3 In-depth understanding of specialist bodies of knowledge: CLO 1

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

PE1.5 Knowledge of engineering design practice: CLO 1

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

PE2.2 Fluent application of engineering techniques, tools and resources: CLO 1

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): CLO 1

PE3.3 Creative, innovative and pro-active demeanour: CLO 1
PE3.4 Professional use and management of information: n/a
PE3.5 Orderly management of self, and professional conduct: n/a
PE3.6 Effective team membership and team leadership: n/a

Additional Course Information

This special topic in Telecommunication covers ***Antenna and Intelligent Reflective Surfaces***.

An antenna is a transitional structure that converts the electromagnetic waves into electric signals known as electric current that are transferred to a receiver using waveguides. An antenna in communication system has the same purpose as the eye for humans. The human eye converts the invisible light into electrical signals known as nerve impulses that are transferred to our brain via optic nerve and then is processed into images. On the contrary to human eye, the antenna also converts the electric signal from a transmitter into electromagnetic waves.

The antenna is an indispensable part of the communication, sensing and imaging systems. With the recent grow of wireless system and smart devices, reliable connection between the devices is the focus of many stake holders, which can be achieved with the proper antenna design techniques.

The ***main objective*** of this course is to familiarize students with the foundational principles of antenna theory and design concepts, empowering them to analyse and create antennas tailored for 6G communication systems. Through a combination of theoretical understanding and practical application using numerical software like CST Studio Suite, students will gain proficiency in assessing and designing antennas. By the course's conclusion, students will possess a comprehensive understanding of key parameters, as well as the Figure-of-Merit, for various antennas and intelligent reflective surfaces. They will also be equipped to design both single and array antennas using CST, preparing them for the designing the next generation of communication technology. Additionally, students will get to see their designed antennas fabricated and tested in a D-band communication system.

Topics covered: Fundamental Parameters and Figure-of-Merit of Antennas, Linear Wire Antennas, Loop Antennas, Linear Array, Metallic waveguides and horn antenna, Travailing wave antenna and broadband antenna, Intelligent reflective surfaces and Microstrip and mobile communication antenna.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Final Result Assessment Format: Individual Short Extension: Yes (3 days)	100%	

Assessment Details

Final Result

Assessment Overview

The assessment will be divided into sub-assessment items that will vary with the special topic that is covered in the course in a particular term. The sub-assessments aim to evaluate a student's level of understanding and mastery of the course materials. The sub-assessments may include group research and presentation. Marks for sub-assessment items will be awarded based on the correctness of the response and against specific criteria in a marking guide. Formal individual feedback on submitted sub-assessment items, excluding any final exam component, will be provided within two weeks of their submission.

Course Learning Outcomes

- CLO1 : After successful completion of this course, students will gain a sound technical knowledge of the specific advanced telecommunications topics covered in this course.

Assignment submission Turnitin type

Not Applicable

General Assessment Information

The assessment scheme in this course reflects the intention to assess your learning progress through the semester. The assessment occurs through, class participation and quizzes, lab reports, course project and the mid-semester and final exam.

- Course project report and presentation 15%
- Labs and online quizzes* 35%
- Mid-Semester Exam 20%
- Final Exam* 30%

*** You must pass both (with at least 50%) Lads and online quizzes and Final exam in order to pass the course.**

Course project (formative assessment, report 9% & presentation 6%)

For the project, it is expected the students from at least a group of two and each group to choose a project from the list provided in Moodle page of the course. The project should contain explanation on how the antenna operates and the specific antenna characteristics (pattern, beamwidth, directivity, input impedance and polarization), design the antenna for the specific case using analytical equations, implement and optimize the design using numerical software CST.

It is expected that each group submit a **course project report** (9% towards the course) in Week 9 and attend a 10-15 minutes session to **present** the design (6% towards the course) in Week 10. The project report preparation detail and style, and rubric for project report and presentation will be available in Moodle.

Labs and online quizzes (summative assessment, 35%)

The course contains four Labs, where you will learn how to use CST numerical software to design simple and complex antenna. These Labs report are required to be completed individually and submitted as indicated under the scheduling tab. There will be weekly on-line quizzes to be completed before the lecture.

Mid-term Exam (20%)

The mid-session 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 course material up to the end of week 4. Marks will be assigned according to the correctness of the responses. The test is of 1 hours duration, and will be held during **Week 5 Thursday 3-4 pm AEST**. This assessment provides 20% contribution towards your course.

Final Exam (30%)

The exam in this course covers all aspects of the course. The examination tests analytical and critical thinking and general understanding of the course material in a controlled fashion.

Grading Basis

Standard

Requirements to pass course

You must pass with at least 50% both Labs and online quizzes and Final exam in order to pass the course.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 0 : 20 May - 26 May	Reading	• Familiarise yourself with the course outline and content, expected submission dates and Moodle page.
Week 1 : 27 May - 2 June	Reading	Week 1 lecture notes. This must be completed before attempting the on-line Quiz.
	Online Activity	Quiz 1 must be completed on-line before lecture 1.
	Lecture	Thursday 3pm-5pm in person rm 108 (G17) Content covered: Week 1 lecture highlights and tutorial
	Tut-Lab	No lab this week
	Assessment	No submission is due this week.
Week 2 : 3 June - 9 June	Reading	Week 2 lecture notes. This must be completed before attempting the on-line Quiz.
	Online Activity	Quiz 2 must be completed on-line before lecture 2.
	Lecture	Thursday 3pm-5pm in person rm 108 (G17) Content covered: Week 2 lecture highlights and tutorial
	Tut-Lab	Thursday 5pm-6pm in person rm 108 (G17) Content covered: Lab 1 - wire antenna
	Assessment	No submission is due this week.
Week 3 : 10 June - 16 June	Reading	Week 3 lecture notes. This must be completed before attempting the on-line Quiz.
	Online Activity	Quiz 3 must be completed on-line before lecture 3.
	Lecture	Thursday 3pm-5pm in person rm 108 (G17) Content covered: Week 3 lecture highlights and tutorial
	Tut-Lab	Thursday 3pm-5pm in person rm 108 (G17) Content covered: Lab 2 - wire antenna array
	Assessment	Submission 1- Lab1 Friday Week 3 (12pm)
Week 4 : 17 June - 23 June	Reading	Week 4 lecture notes. This must be completed before attempting the on-line Quiz.
	Online Activity	Quiz 4 must be completed on-line before lecture 4.
	Lecture	Thursday 3pm-5pm in person rm 108 (G17) Content covered: Week 4 lecture highlights and tutorial
	Tut-Lab	Thursday 5-6pm in person rm 108 (G17) Content covered: Lab 3- Horn antenna
	Assessment	Submission 2- Lab2 by Friday Week 4 (12pm)
Week 5 : 24 June - 30 June	Reading	Get ready for mid-term exam.
	Online Activity	No on-line quiz.
	Lecture	Mid-term exam: Thursday 3-4pm in person rm 108 (G17) Guest Lecture: Thursday 4-5pm in person rm 108 (G17)
	Tut-Lab	Thursday 5-6pm in person rm 108 (G17) Content covered: Lab catch up
	Assessment	Submission 3- Lab3 by Friday Week 5 (12pm)
Week 6 : 1 July - 7 July	Reading	Week 6 lecture notes. This must be completed before attempting the on-line Quiz.
	Online Activity	Quiz 5 must be completed on-line before lecture 6.
	Lecture	Thursday 3-5pm in person rm 108 (G17) Content covered: Week 6 lecture highlights and tutorial
	Tut-Lab	Thursday 5-6pm in person rm 108 (G17) Content covered: course project brief
Week 7 : 8 July - 14 July	Reading	Week 7 lecture notes. This must be completed before attempting the on-line Quiz.
	Online Activity	Quiz 6 must be completed on-line before lecture 7.
	Lecture	Thursday 3-5pm in person rm 108 (G17) Content covered: Week 7 lecture highlights and tutorial
	Tut-Lab	Thursday 11am-12pm in person rm 108 (G17) Content covered: Lab 4 - Intelligent reflective surfaces
Week 8 : 15 July - 21 July	Reading	Week 8 lecture notes. This must be completed before attempting the on-line Quiz.
	Online Activity	Quiz 7 must be completed on-line before lecture 8.
	Lecture	Thursday 3-5pm in person rm 108 (G17) Content covered: Week 8 lecture highlights and tutorial
	Tut-Lab	Thursday 5-6pm in person rm 108 (G17)

		Content covered: Lab 5 – Patch antenna
	Assessment	Submission 4- Lab 4 Friday Week 8 (12pm)
Week 9 : 22 July - 28 July	Reading	Week 9 lecture notes. This must be completed before attempting the on-line Quiz.
	Online Activity	Quiz 8 must be completed on-line before lecture 9.
	Lecture	Thursday 9am-12pm in person rm 108 (G17) Content covered: Week 9 lecture highlights and tutorial
	Tut-Lab	Thursday 5-6pm in person rm 108 (G17) Content covered: Lab 6 – Leaky wave antenna
	Assessment	Submission 5- Lab 5 Friday Week 9 (12pm)
Week 10 : 29 July - 4 August	Reading	Review course material.
	Online Activity	No on-line quiz
	Lecture	Thursday 3-5pm in person rm 108 (G17) Content covered: Studnet seminar presentation, all the students are expected to attend Review and preparation for exam
	Tut-Lab	Thursday 5-6pm in person rm 108 (G17) Content covered: Lab catch up
	Assessment	Submission 6- Lab 6 Friday Week 9 (12pm)

Attendance Requirements

Please note that lecture recordings are not available for this course. Students are strongly encouraged to attend all classes and contact the Course Authority to make alternative arrangements for classes missed.

General Schedule Information

You are expected to attend all sessions, including pre-lecture on-line quizzes, lectures and labs, and mid-semester exams in order to maximise learning. 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 encouraged. UNSW *assumes* that self-directed study of this kind is undertaken in addition to attending face-to-face sessions throughout the course.

The course consists of lectures, labs and a group course project using CST. The lectures will be in person in rm 108 (G17). The labs and course project sessions will be in person in rm 108 (G17).

Course Resources

Prescribed Resources

C. A. Balanis, Antenna Theory : analysis and design, 4th Edition, Wiley-Interscience, 2016.

Recommended Resources

C. A. Balanis, Advanced Engineering Electromagnetics, 2th Edition, Wiley-Interscience, 2012.

W. L. Stutzman and G. A. Thiele, Antenna Theory and design, 3rd edition, Wiley, 2012.

J. J. Carr, Practical Antenna Handbook, 4th Edition, MaGraw-Hill.

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 myExperience. You can also provide feedback to ELSOC who will raise your concerns at student focus group meetings.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Shaghik Ataka ramians		Rm122 (G17)	0431465884		No	Yes
Demonstrator	Qigejian (Alfred) Wang					No	No

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