



TELE8087

Mobile Networks and Security

Session 1, In person-scheduled-weekday, North Ryde 2022

School of Engineering

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Disclaimer

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General Information

Unit convenor and teaching staff Convenor Stephen Hanly stephen.hanly@mq.edu.au Contact via email 44 Waterloo Road room 108 appointment via email
Credit points 10
Prerequisites Admission to MEngElecEng
Corequisites
Co-badged status
Unit description This unit explores mobile communication network principles for cellular and airborne network technology. Topics include wireless channel propagation modelling, path loss and shadowing, small-scale fading, cellular network design, handover and cell association, interference management in heterogeneous networks, mm-wave networks and massive MIMO, satellite networks, and mobile network security.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Solve path-loss and link budget calculations for Heterogeneous cellular systems

ULO2: Demonstrate an understanding of beamforming and blockage in massive MIMO, in mm-wave networks, and in spot beam earth coverage from satellites.

ULO3: Demonstrate an understanding of cell association and handover in HetNets.

ULO4: Demonstrate understanding of challenges of providing security in mobile cellular networks

ULO5: Critique relevant literature and write a research-level review article

ULO6: Demonstrate proficiency in areas of professional engineering practice, including self motivation and self learning, production of quality work to meet a given deadline, communication, and report writing skills

General Assessment Information

Submission deadlines:

All assessments (other than Final Exam) must be submitted by 5:00 pm (Sydney Time) on their due date. Should these assessments be missed due to illness or misadventure, students should apply for Special Consideration. Assessments not submitted by the due date will receive a mark of zero.

On campus activities:

The practicals classes will be held on campus at the scheduled times. Any student who cannot attend on campus should contact the convenor (Stephen Hanly) as soon as possible.

Requirements to pass the unit:

In order to pass this unit a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD).

Final Exam:

If you receive special consideration for the final exam, a supplementary exam will be scheduled by the faculty during a supplementary exam period, typically about 3 to 4 weeks after the normal exam period. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

Mapping of learning outcomes to assessment tasks.

There is an error in the mapping in the unit guide. The correct mapping is as follows:

UL01 maps to Assignments 1, and 2 and Final Exam

UL02 maps to Final Exam

UL03 maps to Assignments 1 and 2 and Final Exam

UL04 maps to Assignment 3 and Final Exam

UL05 maps to the Project

UL06 maps to the Presentation, Project, and Assignments 1,2 and 3

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Project Report</u>	30%	No	Week 12
<u>Assignments 1,2 3</u>	30%	No	Week 4, 7, and 10
<u>Presentation</u>	10%	No	Week 11
<u>Final Examination</u>	30%	No	TBA

Project Report

Assessment Type ¹: Project

Indicative Time on Task ²: 18 hours

Due: **Week 12**

Weighting: **30%**

Students will be allocated individual project topics which will require the students to critique the literature and write a 10 page review article on the allocated topic. Students work on their own, each student gets an individual topic.

On successful completion you will be able to:

- Critique relevant literature and write a research-level review article
- Demonstrate proficiency in areas of professional engineering practice, including self motivation and self learning, production of quality work to meet a given deadline, communication, and report writing skills

Assignments 1,2 3

Assessment Type ¹: Problem set

Indicative Time on Task ²: 18 hours

Due: **Week 4, 7, and 10**

Weighting: **30%**

Three assignments consisting of problem sheets that students work on as homework and submit solutions online.

On successful completion you will be able to:

- Solve path-loss and link budget calculations for Heterogeneous cellular systems
- Demonstrate proficiency in areas of professional engineering practice, including self motivation and self learning, production of quality work to meet a given deadline, communication, and report writing skills

Presentation

Assessment Type ¹: Presentation

Indicative Time on Task ²: 5 hours

Due: **Week 11**

Weighting: **10%**

Students will make a class presentation on an individually allocated topic

On successful completion you will be able to:

- Demonstrate proficiency in areas of professional engineering practice, including self motivation and self learning, production of quality work to meet a given deadline, communication, and report writing skills

Final Examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 18 hours

Due: **TBA**

Weighting: **30%**

Final examination in exam period.

On successful completion you will be able to:

- Solve path-loss and link budget calculations for Heterogeneous cellular systems
- Demonstrate an understanding of beamforming and blockage in massive MIMO, in mm-wave networks, and in spot beam earth coverage from satellites.
- Demonstrate an understanding of cell association and handover in HetNets.
- Demonstrate understanding of challenges of providing security in mobile cellular networks

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

There will be a sequence of audio books uploaded to ilearn each week. There will be weekly workshops for practice problem solving.

Audio books, problem sheets, including problems for assessment, the project and presentation instructions, will be posted to ilearn.

Reference material will be made available on closed reserve in the library. References are:

"Wireless Communications: Principles and Practice", by Theodore Rappaport (Prentice Hall)

"Wireless Communications" by Andrea Goldsmith (Cambridge University Press)

"LTE-The UMTS Long Term Evolution: From Theory to Practice" (2nd Edition) by Stefania Sesia, Issam Toufik and Matthew Baker

"Millimeter Wave Wireless Communications" by Theodore Rappaport, Robert Heath, Robert Daniels and James Murdock (Prentice Hall)

"Computer Networks: A Top-Down Approach" by James Kurose and Keith Ross (Addison Wesley)

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies](https://students.mq.edu.au/support/study/policies) (<https://students.mq.edu.au/support/study/policies>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Engineers Australia Competency Mapping

Knowledge and Skills Base:

- 1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline. UL01
- 1.3 In-depth understanding of specialist bodies of knowledge UL01, UL02, UL03
- 1.4 Discernment of knowledge development and research directions UL05
- 1.5 Knowledge of engineering design practice UL01, UL04

Engineering Application Ability:

- 2.1 Application of established engineering methods to complex problem solving UL01, UL03
- 2.2 Fluent application of engineering techniques, tools and resources. UL01, UL02
- 2.3 Application of systematic engineering synthesis and design processes. UL01, UL02, UL03

Professional and Personal Attributes:

- 3.1 Ethical conduct and professional accountability UL06
- 3.2 Effective oral and written communication in professional and lay domains. UL05, UL06
- 3.4 Professional use and management of information. UL06
- 3.5 Orderly management of self, and professional conduct. UL06

