TELE8087

Mobile Networks and Security

Session 1, In person-scheduled-weekday, North Ryde 2024

School of Engineering

Contents

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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

Project Report

Assessment Type [1]: Project Indicative Time on Task [2]: 18 hours Due: **Week 11** 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

Final Examination

Assessment Type [1]: Examination Indicative Time on Task [2]: 18 hours Due: **Scheduled S1 Final Exam period** 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

Presentation

Assessment Type [1]: Presentation Indicative Time on Task [2]: 5 hours Due: **Week 12**

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

Assignments 1,2 3

Assessment Type [1]: Problem set Indicative Time on Task [2]: 18 hours Due: **weeks 6,9,13**
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

[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

Assessment Tasks

Name	Weighting	Hurdle	Due
Project Report	30%	No	Week 11
Assignments 1,2 3	30%	No	Weeks 6, 9, 13

Name	Weighting	Hurdle	Due
Presentation	10%	No	Week 12
Final Examination	30%	No	Scheduled S1 Final Exam Period

Project Report

Assessment Type [1]: Project
Indicative Time on Task [2]: 18 hours
Due: **Week 11**
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
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Presentation

Assessment Type [1]: Presentation
Indicative Time on Task [2]: 5 hours
Due: **Week 12**
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: **Scheduled S1 Final Exam Period**
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

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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.

The weekly workshops begin in week 1.

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)

Unit Schedule

- Week 1: Introduction to Mobile Networks and Security
- Week 2: Problems on logarithms, dB and random variables
- Week 3: Large-scale Propagation Models
- Week 4: Small-scale Propagation Models
- Week 5: Handover and Cell Association in HetNets
- Week 6-7: Interference Coordination in HetNets
- Week 8: MIMO communications
- Week 9-10: Mobile Network Security
- Weeks 11-13: Project, Presentation and Assignment 3
- Week 12: Student Presentations

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (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). 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) 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 Advocacy provides independent advice on MQ policies, procedures, and processes

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.

Changes from Previous Offering

No changes from previous offering.

Unit information based on version 2024.01R of the Handbook