ELEC826

Advanced Telecommunications Engineering

S1 Day 2019

School of Engineering

Contents

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General Information

Unit convenor and teaching staff
Unit convenor
Rein Vesilo
rein.vesilo@mq.edu.au
Contact via rein.vesilo@mq.edu.au
44 Waterloo Rd Level 1
Tuesday 11am-12noon

Credit points
4

Prerequisites
Admission to MEng and ELEC621 and ELEC645

Corequisites

Co-badged status
ELEC426

Unit description
This unit integrates prior learning in a specialist area of telecommunication engineering with problem solving, emerging technology and aspects of engineering application, technical reporting and self-management to prepare students to work at a professional capacity. The unit aims to address the application of fundamental principles and methods in telecommunication engineering at an advanced level in the context of standards and practices, modelling, analysis, design and practical implementation. The unit also develops skills in the critical evaluation of information, software and sources of error and experimental methods in telecommunication engineering. Learning will be achieved using case studies, laboratories, presentations, group work and traditional lecture format. The specific topics will focus on current advances in telecommunication engineering such as resource allocation, performance analysis, scheduling, network design, mobility, handover, medium-access protocols, and energy efficiency in cellular, mesh, ad hoc and other kinds of wireless networks.

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:

Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.

Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.

Ability to conduct simulation experiments using software simulation tools and report on outputs

Ability to describe, explain and critique research literature related to telecommunications

Plan, develop, and deliver industry-standard work products as would be expected from a project leader.

General Assessment Information

Assignment Tasks

Assignment problems will be posted on iLearn at least two weeks before their submission date. Assignment solutions will be posted within one week after the submission date. Submissions will not be accepted once the solution is posted. All assignments and reports must be submitted electronically through iLearn (in pdf format). Resubmissions will be permitted up to due date.

Extension requests

Must be supported by evidence of medical conditions or misadventure. Extension requests must be submitted through the Ask online system.

Penalties for late submission

Late assignments may incur a penalty of 10% for each day late.

Resubmission options

Once an assignment submission has closed no resubmission of assignments will be permitted.

Hurdle requirements

There are no hurdle requirements.

Satisfactory Completion

To obtain a passing grade (P, Cr, D, HD) an overall mark of 50 or more is required.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	10%	No	Week 5
Assignment 2	10%	No	Week 8
Participation 1	3%	No	Weeks 2-6
Assigment 3	10%	No	Week 10
Assignment 4	10%	No	Week 13
Particpation 2	3%	No	Weeks 7-13
Final Examination	54%	No	University Examination Period

Assignment 1

Due: **Week 5**
Weighting: **10%**

A combination tasks involving theory and problem solving

On successful completion you will be able to:
- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.
- Ability to describe, explain and critique research literature related to telecommunications
- Plan, develop, and deliver industry-standard work products as would be expected from a project leader.

Assignment 2

Due: **Week 8**
Weighting: **10%**

A combination tasks involving theory and problem solving

On successful completion you will be able to:
- Describe and apply advanced concepts and techniques in telecommunications, cellular

and wireless networks, resource allocation, network design and wireless communication theory.

- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.

- Ability to describe, explain and critique research literature related to telecommunications

- Plan, develop, and deliver industry-standard work products as would be expected from a project leader.

Participation 1

Due: **Weeks 2-6**
Weighting: **3%**

Participation in lectures and tutorials.

On successful completion you will be able to:
- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.
- Plan, develop, and deliver industry-standard work products as would be expected from a project leader.

Assigmment 3

Due: **Week 10**
Weighting: **10%**

Matlab based problems.

On successful completion you will be able to:
- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.
- Ability to conduct simulation experiments using software simulation tools and report on outputs
- Plan, develop, and deliver industry-standard work products as would be expected from a

project leader.

Assignment 4

Due: **Week 13**
Weighting: **10%**

A combination of theory and Matlab based problems.

On successful completion you will be able to:
- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.
- Ability to conduct simulation experiments using software simulation tools and report on outputs

Particpation 2

Due: **Weeks 7-13**
Weighting: **3%**

Participation in lectures and tutorials

On successful completion you will be able to:
- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.

Final Examination

Due: **University Examination Period**
Weighting: **54%**

3-hour, closed book exam

On successful completion you will be able to:
- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.

- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.

Delivery and Resources

Classes

The timetable of lectures/tutorials/practicals is available on: http://www.timetables.mq.edu.au/

Required and Recommended Texts and/or Materials

Text book

There is no set textbook for this unit.

Reference book(s)

- A. Goldsmith, Wireless Communications, Cambridge University Press, 2005.

Notes

Lecture and tutorial notes will be provided as required.

Recommended readings

See iLearn page

Technology Used and Required

Various hardware and software tools for analysis, simulation and testing and experimentation of communication systems.

Unit Web Page

Access from the online iLearn Learning System at http://ilearn.mq.edu.au

Laboratory rules

Food and drink are not permitted in the laboratory. Students will not be permitted to enter the laboratory without appropriate footwear. Thongs and sandals are not acceptable.

Notifications

Formal notification of assessment tasks and due dates will be posted on iLearn. Although all reasonable measures to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

Unit Schedule

Week	Lectures/Tutorials

Weeks 1-6	Resource allocation and optimisation in wireless networks
Weeks 7-12	Path loss, statistical multipath fading models, simulation of digital communication systems
Week 13	Revision

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/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

Student Support

Macquarie University provides a range of support services for students. For details, visit http://stu

dents.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

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.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.
- Ability to conduct simulation experiments using software simulation tools and report on

outputs

- Ability to describe, explain and critique research literature related to telecommunications

- Plan, develop, and deliver industry-standard work products as would be expected from a project leader.

Assessment tasks

- Participation 1
- Assignment 4
- Particpation 2

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.

- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.

- Ability to conduct simulation experiments using software simulation tools and report on outputs

- Ability to describe, explain and critique research literature related to telecommunications

Assessment tasks

- Assignment 1
- Assignment 2
- Participation 1
- Assigment 3
- Assignment 4
- Particpation 2
- Final Examination

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and

knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.
- Ability to conduct simulation experiments using software simulation tools and report on outputs
- Ability to describe, explain and critique research literature related to telecommunications

Assessment tasks

- Assignment 1
- Assignment 2
- Participation 1
- Assigment 3
- Assignment 4
- Particpation 2
- Final Examination

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.
- Ability to conduct simulation experiments using software simulation tools and report on

outputs

- Ability to describe, explain and critique research literature related to telecommunications

Assessment tasks

- Assignment 1
- Assignment 2
- Participation 1
- Assignment 3
- Assignment 4
- Particpation 2
- Final Examination

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- Describe and apply advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, network design and wireless communication theory.
- Ability to apply mathematical and optimisation methods to the analysis of advanced telecommunications and wireless systems and networks.
- Ability to conduct simulation experiments using software simulation tools and report on outputs
- Ability to describe, explain and critique research literature related to telecommunications

Assessment tasks

- Assignment 1
- Assignment 2
- Participation 1
- Assignment 3
- Assignment 4
- Particpation 2
- Final Examination

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcome

- Ability to conduct simulation experiments using software simulation tools and report on outputs

Changes from Previous Offering

There are no major changes to the unit.

Changes in response to student feedback

No major changes.