ELEC626

Advanced Telecommunications Engineering

S1 Day 2018

Dept of Engineering

Contents

Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

General Information

Unit convenor and teaching staff
Unit convenor
Rein Vesilo
rein.vesilo@mq.edu.au
Contact via rein.vesilo@mq.edu.au
E6B Level 1
Thursday 3-4

Lecturer
Sam Reisenfeld
sam.reisenfeld@mq.edu.au
Contact via sam.reisenfeld@mq.edu.au
E6B Level 1
Wednesday 4-5

Credit points
4

Prerequisites
Admission to MEng

Corequisites

Co-badged status
ELEC426

Unit description
This unit integrates prior learning in a specialist area of 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 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. Learning will be achieved using case studies, laboratories, presentations, group work and traditional lecture format. The specific topics will focus on current advances in the area 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 **p**roblems 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
Assigmment 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 conduct simulation experiments using software simulation tools and report on outputs
- Ability to describe, explain and critique research literature related to telecommunications

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 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.

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.

Assigment 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

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 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.

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 shown in *iLearn*, 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.

Student Support

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

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

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

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

Assessment tasks

- Assignment 1
- Assignment 2
- Assigment 3
- Particpation 2

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

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

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

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships

with others and the environment, learning from them, and growing - personally, professionally and socially.

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

- Assignment 1
- Assignment 2
- Assigment 3
- Assignment 4
- Particpation 2

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

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

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

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

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

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

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

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- 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

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

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

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

Assessment task

- Assignment 1

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcome

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

Assessment task

- Assignment 1

Changes from Previous Offering

There are no major changes to the unit. The first part of the unit has been rearranged compared to 2017.

Changes in response to student feedback

No major changes.