



# ELEC426

## Advanced Telecommunications Engineering

S1 Day 2014

*Dept of Engineering*

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## General Information

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Unit Convenor

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Credit points

3

Prerequisites

ELEC321(P) and ELEC345(P)

Corequisites

Co-badged status

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:

Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.

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

Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment

Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

## Assessment Tasks

Name	Weighting	Due
<a href="#"><u>Assignment 1</u></a>	20%	Week 7
<a href="#"><u>Assignment 2</u></a>	20%	Week 13
<a href="#"><u>Assignment Logbook</u></a>	5%	TBA
<a href="#"><u>Tutorials</u></a>	5%	TBA
<a href="#"><u>Final Examination</u></a>	50%	University Examination Period

### Assignment 1

Due: **Week 7**

Weighting: **20%**

On successful completion you will be able to:

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

### Assignment 2

Due: **Week 13**

Weighting: **20%**

On successful completion you will be able to:

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

## Assignment Logbook

Due: **TBA**

Weighting: **5%**

On successful completion you will be able to:

- Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

## Tutorials

Due: **TBA**

Weighting: **5%**

On successful completion you will be able to:

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.
- Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

## Final Examination

Due: **University Examination Period**

Weighting: **50%**

3-hour, closed book

On successful completion you will be able to:

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.

## **Delivery and Resources**

### **Satisfactory Completion**

A pass mark in each assessment component and a pass mark in the final examination is needed to satisfactorily complete the unit.

### **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)**

- F. Akyildiz and M. C. Vuran, Wireless Sensor Networks, 1st Edition, Wiley 2010.
- A. Goldsmith, Wireless Communications, Cambridge University Press, 2005.

#### **Notes**

Lecture and tutorial notes will be provided as required.

#### **Recommended readings**

TBA

### **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.

## Laboratory note book

Each student must have a bound exercise book to be used as a tutorial/laboratory note book.

## Extension requests

Must be supported by evidence of medical conditions or misadventure.

## Changes to previous offerering of unit

Sections on wireless sensor networks and wireless communications have been extended.

Section on resource allocation has been removed.

## Unit Schedule

Week	Lectures/Tutorials	Practicals	Events
Week 1	Introduction to wireless sensor networks; Energy consumption in wireless sensor networks		
Week 2	Medium access control in wireless sensor networks - Part 1	Assignment 1 session 1	
Week 3	Medium access control in wireless sensor networks - Part 2	Assignment 1 session 2	
Week 4	Routing in wireless sensor networks - Part 1	Assignment 1 session 3	
Week 5	Radio link design	Assignment 1 session 4	
Week 6	No lecture	Assignment 1 session 5	
Week 7	Routing in wireless sensor networks - Part 2	Assignment 2 session 1	Assignment 1 due
Week 8	Simulation of digital communication systems	Assignment 2 session 2	
Week 9	Pathloss and shadowing	Assignment 2 session 3	
Week 10	Statistical multipath fading models - Part 1	Assignment 2 session 4	

Week 11	Statistical multipath fading models - Part 2	Assignment 2 session 5	
Week 12	Guest lecture		
Week 13	Revision		Assignment 2 due

## Policies and Procedures

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

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy [http://mq.edu.au/policy/docs/grievance\\_management/policy.html](http://mq.edu.au/policy/docs/grievance_management/policy.html)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html) *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of 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/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## 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](http://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](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

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

## Graduate Capabilities

### 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

- Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

### 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

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.
- Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

## 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

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.
- Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

## 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**

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.
- Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

## **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**

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.
- Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation

## **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

- Understanding of the advanced concepts and techniques in telecommunications, cellular and wireless networks, resource allocation, scheduling, network design, energy efficiency and performance analysis.
- Ability to apply mathematical methods to the analysis of advanced telecommunications systems and networks.
- Ability to conduct laboratory experiments using advanced networks, systems, simulation tools, and equipment

## 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 laboratory experiments using advanced networks, systems, simulation tools, and equipment
- Ability to understand, critique and assess research literature related to telecommunications including delivery of outputs as a report and as a presentation