ELEC345

Communication Networks

S1 Day 2017

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
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Credit points
3

Prerequisites
(39cp at 100 level or above) including COMP247(P)

Corequisites

Co-badged status

Unit description
This unit develops core knowledge and understanding in telecommunications engineering examining the technology, concepts and general principles used in modern data communication networks. The focus is on layers 1 and 2 of the OSI reference model spanning local-area, wide-area, metropolitan and access networks and includes Ethernet, wireless networks, optical networks, time-division multiplexing networks and cellular networks. The unit examines these technologies from a number of different perspectives including physical-layer communications, medium access control (MAC), link-layer, network structure, devices, modelling, performance analysis and quality of service. A practical component gives students skills in using and configuring network equipment and modelling and analysis tools.

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:

Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.

Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.

Have knowledge of a range of modelling techniques, including mathematical modelling and simulation modelling, including appropriate simulation tools, to design and analyse communication technologies and networks.

Be able to design, build and operate networks using switches and routers.

Understand networks and communications systems from a systems perspective.

Be able to work in small groups on networking problems.

General Assessment Information
Notifications

Formal notification of assessment tasks, grading rubrics 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.

Report and 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.

Hurdle requirement

There is no hurdle requirement except that the overall pass mark of 50 must be reached.

Satisfactory performance

A mark of 50 or more is required to obtain a passing grade (P/CR/D/HD)

Assessment Tasks

Name	Weighting	Hurdle	Due
Final examination	52%	No	Examination period
Assignment 0	3%	No	Week 3
Assignment 1	7%	No	Week 4

Name	Weighting	Hurdle	Due
Assignment 2	10%	No	Week 7
Assignment 3	10%	No	Week 10
Assignment 4	10%	No	Week 12
Laboratories	5%	No	Throughout semester
Participation	3%	No	Throughout semester

Final examination

Due: **Examination period**
Weighting: **52%**

Closed book examination of 3 hours duration.

On successful completion you will be able to:
- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Have knowledge of a range of modelling techniques, including mathematical modelling and simulation modelling, including appropriate simulation tools, to design and analyse communication technologies and networks.
- Understand networks and communications systems from a systems perspective.

Assignment 0

Due: **Week 3**
Weighting: **3%**

This is a short diagnostic assignment early in the session.

On successful completion you will be able to:
- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.

Assignment 1

Due: **Week 4**
Weighting: **7%**

This is a set of problems usually involving some degree of numerical computation, using equations, explaining concepts, application of techniques, critical analysis or use of Matlb.

On successful completion you will be able to:
- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Have knowledge of a range of modelling techniques, including mathematical modelling and simulation modelling, including appropriate simulation tools, to design and analyse communication technologies and networks.
- Understand networks and communications systems from a systems perspective.

Assignment 2

Due: **Week 7**
Weighting: **10%**

This is a set of problems usually involving some degree of numerical computation, using equations, explaining concepts, application of techniques, critical analysis or use of Matlb.

On successful completion you will be able to:
- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Have knowledge of a range of modelling techniques, including mathematical modelling and simulation modelling, including appropriate simulation tools, to design and analyse communication technologies and networks.
- Understand networks and communications systems from a systems perspective.

Assignment 3

Due: **Week 10**

Weighting: **10%**

This is a set of problems usually involving some degree of numerical computation, using equations, explaining concepts, application of techniques, critical analysis or use of Matlb.

On successful completion you will be able to:
- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Have knowledge of a range of modelling techniques, including mathematical modelling and simulation modelling, including appropriate simulation tools, to design and analyse communication technologies and networks.
- Understand networks and communications systems from a systems perspective.

Assignment 4

Due: **Week 12**
Weighting: **10%**

This is a set of problems usually involving some degree of numerical computation, using equations, explaining concepts, application of techniques, critical analysis or use of Matlb.

On successful completion you will be able to:
- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Understand networks and communications systems from a systems perspective.

Laboratories

Due: **Throughout semester**
Weighting: **5%**

Assessment based on work done in laboratories with networking equipment, Matlab and Opnet simulation.

On successful completion you will be able to:
- Have knowledge and understanding of a range of modern communication and

networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.

- Be able to design, build and operate networks using switches and routers.
- Understand networks and communications systems from a systems perspective.
- Be able to work in small groups on networking problems.

Participation

Due: **Throughout semester**
Weighting: **3%**

Active participation in tutorial sessions

On successful completion you will be able to:

- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Understand networks and communications systems from a systems perspective.

Delivery and Resources

Practical sessions

There are eleven weekly laboratory sessions, starting in Week 2.

Late assignments

Late assignments will be penalised 10% per day of lateness except if a request for extension based on medical or other exception circumstances is submitted (disruption to studies) and approved.

Technology used

Library and internet search engines, word processing and presentation software, Cisco switches and routers, Atlas ADTRAN switches, Matlab software.

Laboratory Safety

No student will be permitted to enter the laboratory without proper footwear. THONGS OR SANDALS ARE NOT ACCEPTABLE. NO FOOD OR DRINK may be taken into the laboratory.

Text book

Communication Networks A Concise Introduction, by J. Walrand and S. Parekh, Morgan & Claypool Publishers, 2010.

Reference book(s)

Networking, Second edition, J. S. Beasley, Pearson, 2009.

Data Communications and Networking, 4th Edition by B. A. Forouzan, McGraw-Hill, 2007.

Data and Computer Communications, 9th ed W. Stallings, Pearson, 2012

Lecture and laboratory notes

Lecture notes, laboratory notes, workshop notes, assignments and resources are provided online through iLearn.

Unit Schedule

Topics covered include Ethernet, wireless LANs, packet switched networks, time division multiplexing networks, cellular networks, optical networks, Markov chain modelling, queueing models, quaity of service.

Please refer to ilearn for the detailed list of topics and their scheduling.

Learning and Teaching Activities

Lectures

Lectures are used to cover concepts and techniques communication networks and the theoratical component of the unit. There are two one hour lectures a week. The first lecture is followed by a one hour tutorial.

Practicals

Practical sessions for the first half of the unit involve constructing LANS and configuring Cisco switches. There is a practical on configuring frame relay switches using the Atlas ADTRAN switch. The practicals in the second half of the unit involve use of the Matlab to study the performance of communications networks.

Tutorials

The 2 hour lecture period is divided into a one hour (approximately) lecture followed by a tutorial. The purpose of the tutorial is to support the study of lecture material and other work.

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

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy_2016.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

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/

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

- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Be able to design, build and operate networks using switches and routers.
- Understand networks and communications systems from a systems perspective.

Assessment tasks

- Final examination
- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Laboratories

Learning and teaching activities

- Practical sessions for the first half of the unit involve constructing LANS and configuring Cisco switches. There is a practical on configuring frame relay switches using the Atlas ADTRAN switch. The practicals in the second half of the unit involve use of the Matlab to study the performance of communications networks.

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

- Be able to design, build and operate networks using switches and routers.
- Be able to work in small groups on networking problems.

Assessment tasks

- Laboratories
- Participation

Learning and teaching activities

- Practical sessions for the first half of the unit involve constructing LANS and configuring Cisco switches. There is a practical on configuring frame relay switches using the Atlas ADTRAN switch. The practicals in the second half of the unit involve use of the Matlab to study the performance of communications networks.
- The 2 hour lecture period is divided into a one hour (approximately) lecture followed by a tutorial. The purpose of the tutorial is to support the study of lecture material and other work.

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

- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Be able to work in small groups on networking problems.

Assessment tasks

- Laboratories
- Participation

Learning and teaching activities

- Lectures are used to cover concepts and techniques communication networks and the theoratical component of the unit. There are two one hour lectures a week. The first lecture is followed by a one hour tutorial.
- Practical sessions for the first half of the unit involve constructing LANS and configuring Cisco switches. There is a practical on configuring frame relay switches using the Atlas ADTRAN switch. The practicals in the second half of the unit involve use of the Matlab to study the performance of communications networks.
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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

- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Have knowledge of a range of modelling techniques, including mathematical modelling and simulation modelling, including appropriate simulation tools, to design and analyse communication technologies and networks.
- Understand networks and communications systems from a systems perspective.

Assessment tasks

- Final examination
- Assignment 0
- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Laboratories
- Participation

Learning and teaching activities

- Lectures are used to cover concepts and techniques communication networks and the theoratical component of the unit. There are two one hour lectures a week. The first lecture is followed by a one hour tutorial.
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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

- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Have knowledge of a range of modelling techniques, including mathematical modelling and simulation modelling, including appropriate simulation tools, to design and analyse communication technologies and networks.
- Understand networks and communications systems from a systems perspective.

Assessment tasks

- Final examination
- Assignment 0
- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Laboratories
- Participation

Learning and teaching activities

- Lectures are used to cover concepts and techniques communication networks and the theoratical component of the unit. There are two one hour lectures a week. The first lecture is followed by a one hour tutorial.
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- The 2 hour lecture period is divided into a one hour (approximately) lecture followed by a tutorial. The purpose of the tutorial is to support the study of lecture material and other work.

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

- Understand and be able to apply high level principles to describe, design and analyse communication technologies and networks.
- Have knowledge of a range of modelling techniques, including mathematical modelling and simulation modelling, including appropriate simulation tools, to design and analyse communication technologies and networks.
- Be able to design, build and operate networks using switches and routers.

Assessment tasks

- Final examination
- Assignment 0
- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Laboratories
- Participation

Learning and teaching activities

- Lectures are used to cover concepts and techniques communication networks and the theoratical component of the unit. There are two one hour lectures a week. The first lecture is followed by a one hour tutorial.
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- The 2 hour lecture period is divided into a one hour (approximately) lecture followed by a tutorial. The purpose of the tutorial is to support the study of lecture material and other work.

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

- Have knowledge and understanding of a range of modern communication and networking technologies and be able to analyse these technologies in terms of the high level principles in point 1.
- Be able to work in small groups on networking problems.

Assessment tasks

- Final examination

- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Laboratories
- Participation

Learning and teaching activities

- Practical sessions for the first half of the unit involve constructing LANS and configuring Cisco switches. There is a practical on configuring frame relay switches using the Atlas ADTRAN switch. The practicals in the second half of the unit involve use of the Matlab to study the performance of communications networks.
- The 2 hour lecture period is divided into a one hour (approximately) lecture followed by a tutorial. The purpose of the tutorial is to support the study of lecture material and other work.

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

- Be able to work in small groups on networking problems.

Assessment task

- Laboratories

Learning and teaching activity

- Practical sessions for the first half of the unit involve constructing LANS and configuring Cisco switches. There is a practical on configuring frame relay switches using the Atlas ADTRAN switch. The practicals in the second half of the unit involve use of the Matlab to study the performance of communications networks.
- The 2 hour lecture period is divided into a one hour (approximately) lecture followed by a tutorial. The purpose of the tutorial is to support the study of lecture material and other work.

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

- Understand networks and communications systems from a systems perspective.

Assessment task

- Laboratories

Learning and teaching activity

- The 2 hour lecture period is divided into a one hour (approximately) lecture followed by a tutorial. The purpose of the tutorial is to support the study of lecture material and other work.

Changes from Previous Offering

There are only minor changes from the previous offering.