



# COMP247

## Data Communications

S1 Day 2013

*Computing*

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## General Information

Unit convenor and teaching staff

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E6A337

By Appointment

Credit points

3

Prerequisites

3cp(P) from 100-level COMP or 100-level ISYS units

Corequisites

Co-badged status

Unit description

This unit introduces basic data communication concepts, theory and practice within the context of the use of communication networks in organisations. Topics include: protocols and standards, including the OSI model; network switching and routing; LAN and WAN topologies; wireless networking; network hardware, such as routers, modems, repeaters, switches and hubs; public telecommunication-based data services; the effect of telecommunications on society; the role of telecommunications within organisations; introduction to security and network management; organisational management of telecommunications; introduction to network design; and regulatory frameworks. Practical work includes basic network hardware set up and protocol performance using Cisco routers and switches. This unit does not presume any knowledge of programming nor is there any programming work in the unit.

## 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:

Have an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,

Have a working knowledge of practical networking, including Build cables, Design a simple local area network, Basic configuration of networking devices, Construction of simple networks, Analysis of network traffic, Network documentation

These learning outcomes (L.O. for short) will be assessed against the following criteria:

-Network protocols and Network technologies for L.O. #1 -Technical networking proficiency for L.O. #2 See also the different standards corresponding to these criteria.

## Assessment Tasks

Name	Weighting	Due
<u>Quizzes</u>	10%	Weeks 6, 12
<u>Practical work</u>	10%	Weekly
<u>Assignments</u>	30%	Weeks 7, 11
<u>Final Examination</u>	50%	TBA

### Quizzes

Due: **Weeks 6, 12**

Weighting: **10%**

There will be two quizzes in the following weeks: 6 and 12. Each quiz is worth 5 marks. A quiz is a short test that will be based on your previously attempted discussion questions and previous lecture material. For example, the week 6 quiz will be based on discussion topics/lectures done in weeks 1 to 4. The quiz questions will be handed over to you at the beginning of your Practical class. The quiz will occupy approximately half an hour of the practical class for that week. These quizzes contribute 10% of the total mark and serves as a feedback mechanism to monitor your progress in the unit.

If you are unable to attend your practical on the day of your quizz please contact the tutor **at the**

## earliest possible time.

On successful completion you will be able to:

- Have an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,

## Practical work

Due: **Weekly**

Weighting: **10%**

The practical work in this unit makes up 10% of your mark. The practical work is divided up into 11 sections out of which you need to complete any 10. The first four will be available before the semester begins. Each section is worth 2 marks. To receive your marks you must attend the practical section and demonstrate your completion of the section to your practical supervisor. Earning the marks will require not only successful completion of the exercises, but presentation of appropriate documentation, as outlined in the question sheets. You should complete the practical session in the week it is allocated. (and the practical material is structured against the lecture material with this in mind).

**Note** that there are a total of **11 practical** sections but **12** practical sessions. This allows you to miss one or two but still complete the material. If you complete your quota of all **10** sections, you may complete the last section in the remaining weeks. No extra mark will be given for doing more than 10 practical sections. We however **advise** you to complete **all 11 sections** to gain a good understanding of the covered topics.

## General notes on Practicals

While the practical sections can be submitted at your own pace, be warned that leaving too many too late in the semester may result in you being unable to complete them all. No allowance will be made for students who fail to finish work because they have left themselves insufficient time.

**Note** that while the practical material is structured against the lecture material, you need to keep in mind that there will not always be a one to one mapping between the practical exercises and the lecture topics. This is because you need some practical sessions to get acquainted to new tools and devices thereby limiting the number of practical time slots available to experiment with technologies discussed in some lectures.

On successful completion you will be able to:

- Have a working knowledge of practical networking, including Build cables, Design a

simple local area network, Basic configuration of networking devices, Construction of simple networks, Analysis of network traffic, Network documentation

## Assignments

Due: **Weeks 7, 11**

Weighting: **30%**

There are two assignments. The first assignment tests your understanding of local area networks, routing, and IP addressing. In addition, it gives you an opportunity to master subnetting through extra practice. The second assignment tests your understanding of various networking technologies.

Your assignments are to be submitted in the assignment box in the first floor of Building E6A. Late submission of the assignment will be accepted, but penalised at the rate of 10% per working day late. If you cannot submit assignments on time because of illness or other circumstances, please contact the convenor **at the earliest possible time**.

## General notes on assignment

For all submitable assignment work you are encouraged to:

- set your personal deadline earlier than the actual one;
- keep backup of all important files;
- make sure that no one else picks up your printouts.

On successful completion you will be able to:

- Have an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,

## Final Examination

Due: **TBA**

Weighting: **50%**

An examination allows us to individually and securely assess student's mastery of the coursework material. The examination will material covered by learning outcome #1. The examination will be closed book and three (3) hours in length

Regarding the examination process, note that

- you must attend all required classes and submit all required assessment, otherwise the Executive Dean of the Faculty or delegated authority has the power to refuse permission to attend the final examination
- the University Examination period in for First Half Year 2013 is from Tuesday 11th June to Saturday 28th June 2013
- you are expected to present yourself for examination at the time and place designated in the [University Examination Timetable](#)
- the timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of examinations
- no early examinations for individuals or groups of students will be set. All students are expected to ensure that they are available until the end of the teaching semester, that is the final day of the official examination period
- the only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for [Special Consideration](#).

On successful completion you will be able to:

- Have an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,

## Delivery and Resources

### CLASSES

Each week you should attend three hours of lectures, and a two hour practical. For details of days, times and rooms consult the [timetables webpage](#) or the unit web page on iLearn.

**Note** that practicals (lab sessions) commence in **week 2 except for the Friday batch whose first practical session is in week 1**. A full week-by-week schedule of the practical (lab) classes can be found on iLearn.

You should have selected a practical at enrolment. **You should attend the practical you are enrolled in.** (Note that two quizzes will be held throughout the semester in practical classes, and you must attend your assigned class to participate in the quiz.) If you do not have a class, or if

you wish to change one, you should see the enrolment operators in the E7B courtyard during the first two weeks of the semester. Thereafter you should go to the Student Centre. In cases of severe difficulty, please contact the unit convenor.

## Resources to assist your learning

### **Required AND Recommended Texts AND/OR Materials**

#### **Textbook**

The textbook for this semester is:

- Fitzgerald, J. & Dennis, A, Business Data Communications and Networking, Eleventh Edition, Wiley 2012. ISBN 978-0-471-77116-6

Additional reading that you may find useful for this unit:

- Stallings, W., Business Data Communications, 6th ed., Pearson Prentice Hall, 2009
- Goldman, J. & Rawles, P., Applied Data Communications, 4th ed. Wiley, 2004
- Kurose, J. & Ross, K., Computer Networking, 3rd ed., Addison Wesley, 2005
- Peterson, L. & Davie, B., Computer Networks: A Systems approach, 3rd ed., Morgan Kaufman, 2003
- Stallings, W., Data & Computer Communications, 7th ed., Prentice Hall, 2004
- Rowe, S. & Schuh, M., Computer Networking, Pearson Prentice Hall, 2005
- White, C., Data Communications and Computer Networks, 3rd ed., Thomsons, 2004

## UNIT WEBPAGE AND TECHNOLOGY USED AND REQUIRED

#### **Websites**

The web page for this unit can be found at <http://www.comp.mq.edu.au/units/comp247>

Unit content and discussion boards are on [iLearn \(http://ilearn.mq.edu.au\)](http://ilearn.mq.edu.au).

#### **iLecture**

Digital recordings of lectures are available. Read instructions [here](#).

#### **Technology**

In this unit you will be exposed to the following technology and tools:

- Cisco equipment and the Cisco IOS
- Wireshark Packet Analyzer software
- TracePlus Ethernet: Performance and Packet Capturing tool

## Unit Schedule

1	Introduction	Chapter 1	
2	Local Area Networks	Chapter 6	Introduction
3	IP	Chapter 5	Introduction to Wireshark
4	TCP, more IP, Applications	Chapters 5 & 2	Switches MAC addresses, ARP
5	Physical Layer	Chapter 3	Subnetting
6	Data Link Layer	Chapter 4	Internet Protocol
7	Wireless Local Area Networks	Chapter 6	TCP
	Public Holiday; Revision		
8	Backbone Networks	Chapter 7	Introduction to IOS
9	Metropolitan and Wide Area Networks	Chapter 8	Building a routed network
10	The Internet	Chapter 9	Virtual LAN -1
11	Network Security	Chapter 10	Virtual LAN -2
12	Network Security (Contd)	Chapter 10	Security
13	Network security (Contd) Exam Preparation		

## 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://www.mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://www.mq.edu.au/policy/docs/academic_honesty/policy.html)

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

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

Grade Appeal Policy <http://www.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)

Special Consideration Policy [http://www.mq.edu.au/policy/docs/special\\_consideration/policy.html](http://www.mq.edu.au/policy/docs/special_consideration/policy.html)

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

### Special Consideration

Special Consideration is intended for a student who is prevented by serious and unavoidable disruption from completing any unit requirements in accordance with their ability. This application form needs to be filled and submitted to the Science Centre along with some evidence to support



your case. Depending on the circumstances presented, the convenor may choose to give you an alternate assessment, additional time for an assessment, make-up exam, etc. If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled after the conclusion of the official examination period. **For details of the Special Consideration policy specific to the Department of Computing, see the Department's [policy page](#).**

## Grade Appeal

In case of problems arising with your final grade, the first step is to organise a review. The Department recommends that you request an appointment with the convenor of the unit in order to review your grade. If the review does not solve the problem, a formal Grade Appeal can be lodged. For more information please refer to the grade appeal policy page at:

<http://www.mq.edu.au/policy/docs/gradeappeal/policy.html>

## Academic Honesty and Plagiarism

Plagiarism involves using the work of another person and presenting it as one's own. The Department, in line with [University policy](#), treats all cases seriously. In particular, the Department keeps a record of all plagiarism cases. This record is referred to so that an appropriate penalty can be applied to each case.

For concrete examples, refer to Academic Honesty Policy at: [http://www.mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://www.mq.edu.au/policy/docs/academic_honesty/policy.html)

## Student Support

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at: <http://students.mq.edu.au/support/>

### UniWISE provides:

- Online learning resources and academic skills workshops [http://www.students.mq.edu.au/support/learning\\_skills/](http://www.students.mq.edu.au/support/learning_skills/)
- Personal assistance with your learning & study related questions.
- The Learning Help Desk is located in the Library foyer (level 2).
- Online and on-campus orientation events run by Mentors@Macquarie.

## Staff-Student Liaison Committee

The Department has established a Staff-Student Liaison Committee at each level (100, 200, 300) to provide all students studying a Computing unit the opportunity to discuss related issues or problems with both students and staff. If you would like to raise any issues or make comments, please attend a liaison committee meeting, or discuss the matter with one of the student representatives who will be attending the meeting.

The committee meets two or three times during the semester. For each meeting, an agenda is issued and minutes are taken. These are posted on the web at <http://www.comp.mq.edu.au/units/200-liaison>

If you have concerns about anything related to the organisation or operation of COMP247, please convey those concerns to the unit convenor, either directly or through the liaison committee. If you have exhausted all other avenues, then you should consult the Director of Teaching (Dr. Rolf Schwitter) or the Head of Department (Prof. Bernard Mans). You are entitled to have your concerns raised, discussed and resolved.

## 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

Details of these services can be accessed at <http://www.student.mq.edu.au/ses/>.

## IT Help

If you wish to receive IT help, we would be glad to assist you at <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 and it outlines what can be done.

## Graduate Capabilities

### 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 an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,
- Have a working knowledge of practical networking, including Build cables, Design a simple local area network, Basic configuration of networking devices, Construction of simple networks, Analysis of network traffic, Network documentation

## Assessment tasks

- Quizzes
- Assignments
- Final Examination

## 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

- Have an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,
- Have a working knowledge of practical networking, including Build cables, Design a simple local area network, Basic configuration of networking devices, Construction of simple networks, Analysis of network traffic, Network documentation

## Assessment tasks

- Quizzes
- Practical work
- Assignments
- 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**

- Have an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,
- Have a working knowledge of practical networking, including Build cables, Design a simple local area network, Basic configuration of networking devices, Construction of simple networks, Analysis of network traffic, Network documentation

## **Assessment tasks**

- Quizzes
- Practical work
- Assignments
- Final Examination

## **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**

- Have an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,
- Have a working knowledge of practical networking, including Build cables, Design a simple local area network, Basic configuration of networking devices, Construction of simple networks, Analysis of network traffic, Network documentation

## Assessment tasks

- Assignments
- 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

- Have an introductory understanding of various areas of data communications, including the importance and role of protocols, how protocol stacks work and the layers of the internet protocol stack, the functions of each layer of the internet, protocol stacks, and selected, protocols at each layer, in particular, IP, addressing, routing and subnetting, LAN structures, components, ethernet, MAC, and ARP, Wireless and backbone networks, Metropolitan and wide area networks and the, Internet, Network security, design and management,
- Have a working knowledge of practical networking, including Build cables, Design a simple local area network, Basic configuration of networking devices, Construction of simple networks, Analysis of network traffic, Network documentation

## Assessment tasks

- Practical work
- Assignments

## Standards and grading

### Standards

L.O 1	Pass	Credit	Distinction	High Distinction
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<p><b>Network Protocols</b></p>	<p>Demonstrate an understanding of the definition and function of protocols and protocol stacks. Demonstrate an understanding of the function of each layer in the TCP/IP protocol stack. Demonstrate an understanding of the internals of each layer in the TCP/IP protocol stack, including IP addressing and routing</p>	<p>Satisfy the standard for Credit and in addition demonstrate a detailed understanding of most of the protocols at each layer of the TCP/IP protocol stack. Understand and be able to use subnetting.</p>	<p>Satisfy the standard for Credit and in addition demonstrate a sustained detailed understanding of the protocols at each layer of the TCP/IP protocol stack. Demonstrate some ability to reason with and use this knowledge to explain protocol design decisions.</p>	<p>Satisfy the standard for Distinction and in addition demonstrate a sustained ability to reason with and use this knowledge to explain protocol design decisions.</p>
<p><b>Network Technology</b></p>	<p>Demonstrate an understanding of the structure and use of the various types of networks. Demonstrate an understanding of the function of basic network components. Demonstrate some understanding of the technology used to implement wireless networks, backbone networks, MANs &amp; WANs</p>	<p>Satisfy the standard for Pass and in addition demonstrate a detailed understanding of the technology used to implement wireless networks, backbone networks, MANs &amp; WANs</p>	<p>Satisfy the standard for Credit and in addition demonstrate some ability to reason with and use this knowledge in making network design decisions.</p>	<p>Satisfy the standard for Distinction and in addition demonstrate a sustained ability to reason with and use this knowledge in making network design decisions.</p>

L.O 2	Pass	Credit	Distinction	High Distinction
<p><b>Technical Networking Proficiency</b></p>	<p>Able to successfully connect and configure computers, switches and routers in a network. Limited ability to analyse network traffic using a packet sniffer. Limited ability to produce clear and comprehensive documentation of network setup, configuration and analysis.</p>	<p>Satisfy the standard for pass and in addition be able to successfully analyse basic network traffic flows using a packet sniffer and demonstrate ability to produce clear and comprehensive documentation of network setup, configuration and analysis.</p>	<p>Satisfy the standard for credit and in addition be able to analyse multi-protocol traffic flows using a packet sniffer and demonstrate consistent ability to produce clear and comprehensive documentation of network setup, configuration and analysis.</p>	<p>Satisfy the standard for distinction and in addition demonstrate originality and insight in their documentation and analysis of network setup, configuration and traffic</p>

In particular, students who will pass this unit will

- obtain an overall mark of at least 50% (calculated according to the weightings given above).
- perform at a **Pass** level or higher in the final examination.
- perform at a **Pass** level or higher in assignments, quizzes, and practicals combined.
- make a reasonable attempt at the practical exercises.

Students obtaining a higher grade than a pass in this unit will (in addition to the above)

- have a total mark of 85% or higher and perform at distinction level or higher in the final examination to obtain **High Distinction**;
- have a total mark of 75% or higher and perform at credit level or higher in the final examination to obtain **Distinction**;
- have a total mark of 65% or higher and perform at pass level but with 55% or higher in the final examination to obtain **Credit**.

You are encouraged to:

- set your personal deadline earlier than the actual one;
- keep backups of all important assessed tasks;
- make sure no one else picks up your printouts.

## Teaching and Learning Strategy

COMP247 is taught via lectures and laboratory practical sessions. Lectures are used to introduce new material, give examples of the use of networking concepts and techniques and put them in a wider context. While lectures are largely one to many presentations, you are encouraged to ask questions of the lecturer to clarify anything you might not be sure of. Tutorial style discussions on important topics will be conducted in the lectures. These discussions will give you the opportunity to interact with your peers as well as the lecturer. Practical classes give you an opportunity to practice your practical networking skills under the supervision of a demonstrator. Each week you will be given a number of problems to work on; it is important that you keep up with these problems as doing so will help you understand the material in the unit and prepare you for the work in assignments.

At the end of each week, a **tutorial exercise** will be posted to test your understanding of that week's material. Even though these tutorial exercises are not formally assessed, it is important that you solve them on a weekly basis as these questions are often previous exam questions or

structured like test/exam questions. The more practice you have at such questions, the more likely you are to do yourself justice in quizzes/exams. Solutions to these exercises will be regularly posted on ilearn unit site. If need be, this will also allow you to discuss the problems effectively with your lecturer/peers and maximise the feedback you get on your work. In case of any difficulty, seek help from the teaching staff.

Each week you should:

- Attend lectures, take notes, ask questions, seek feedback from the lecturer.
- Read appropriate sections of the text, add to your notes and prepare questions for your lecturer/practical demonstrator.
- Attend the practical session, do as many of the practical problems as you can and seek feedback from the practical demonstrator on your work.
- Prepare answers to tutorial questions and if need be, seek feedback from the teaching staff.
- Work on any assignments that have been released.

Lecture notes will be made available each week but these notes are intended as an outline of the lecture only and are not a substitute for your own notes or the textbook.