



# COMP247

## Data Communications

S1 Day 2019

*Dept of Computing*

### Contents

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<a href="#"><u>General Information</u></a>	2
<a href="#"><u>Learning Outcomes</u></a>	2
<a href="#"><u>General Assessment Information</u></a>	3
<a href="#"><u>Assessment Tasks</u></a>	3
<a href="#"><u>Delivery and Resources</u></a>	6
<a href="#"><u>Unit Schedule</u></a>	8
<a href="#"><u>Policies and Procedures</u></a>	9
<a href="#"><u>Graduate Capabilities</u></a>	10
<a href="#"><u>Changes from Previous Offering</u></a>	15
<a href="#"><u>Grading</u></a>	16
<a href="#"><u>Changes since First Published</u></a>	17

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## General Information

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Credit points

3

Prerequisites

COMP115 or ISYS114

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 in a specialised laboratory using dedicated switching and routing equipment. 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:

Enunciate the importance and the role of network protocols including why they are organised into protocol stacks and how protocol stacks function.

Demonstrate an understanding of IP addressing, routing and subnetting by for example

computing routing outcomes and determining effective and actual IP addresses.

Differentiate among LAN components, and describe and, in particular instances calculate, how MAC addresses, address resolution (as implemented by protocols such as ARP) and the ethernet protocol interact.

Be aware of different major network technologies including wireless, backbone, wide area networks, and the Internet and, being aware of their properties, be able to evaluate different network designs.

Demonstrate technical networking proficiency including demonstrated ability to configure, construct, and document, and in simple cases, design networks, as well as the ability to perform traffic analysis on local area networks.

Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## General Assessment Information

### Assignments

Assignment work must be written clearly, with good grammar, correct word usage, correct punctuation, and lack of spelling errors. Poor or bad expression will be penalized. Wherever required, all written work must be properly referenced and conform to standard stylistic conventions.

### Practicals

**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.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Practical Workshops</u>	10%	Yes	Every week
<u>Assignment 1</u>	15%	No	Week 6
<u>Assignment 2</u>	15%	No	Week 11
<u>Module Exams</u>	60%	Yes	Various

### Practical Workshops

Due: **Every week**

Weighting: **10%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

The practical work in this unit makes up 10% of your mark. The practical work is divided up into twelve sections. Practical classes are a hurdle requirement, and, as such you will be required to perform to a satisfactory standard in at least eight of the practical classes to pass the unit. Each practical contributes 1% of your total mark for the unit, the total mark will be made by taking the total of the best 10 practical session 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 must complete the practical session in the week it is allocated.

Practical classes will commence during week 2 of the semester. Students must be enrolled in two practical classes: Practical\_1 and Practical\_2.

Practical\_1 will utilise specialised networking equipment located in an Engineering Laboratory whereas Practical\_2 will be conducted in a regular Computing Laboratory.

The student cohort has been divided into two streams:

Students in streams 1 through 11 will attend their Practical\_1 in weeks 2, 4, 6, 8, 10, 12 and Practical\_2 in weeks 3, 5, 7, 9, 11, 13.

Students in streams 12 through 22 will attend their Practical\_1 in weeks 3, 5, 7, 9, 11, 13 and Practical\_2 in weeks 2, 4, 6, 8, 10, 12.

On successful completion you will be able to:

- Enunciate the importance and the role of network protocols including why they are organised into protocol stacks and how protocol stacks function.
- Demonstrate an understanding of IP addressing, routing and subnetting by for example computing routing outcomes and determining effective and actual IP addresses.
- Differentiate among LAN components, and describe and, in particular instances calculate, how MAC addresses, address resolution (as implemented by protocols such as ARP) and the ethernet protocol interact.
- Demonstrate technical networking proficiency including demonstrated ability to configure, construct, and document, and in simple cases, design networks, as well as the ability to perform traffic analysis on local area networks.
- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## Assignment 1

Due: **Week 6**

Weighting: **15%**

The first assignment tests your understanding of local area networks, routing, and IP addressing.

Late submission of the assignment will be accepted, but penalised at the rate of 15% per day late. If you cannot submit assignments on time because of illness or other circumstances, please apply for disruption of studies.

For all 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 has access to any of your work.

On successful completion you will be able to:

- Enunciate the importance and the role of network protocols including why they are organised into protocol stacks and how protocol stacks function.
- Demonstrate an understanding of IP addressing, routing and subnetting by for example computing routing outcomes and determining effective and actual IP addresses.
- Differentiate among LAN components, and describe and, in particular instances calculate, how MAC addresses, address resolution (as implemented by protocols such as ARP) and the ethernet protocol interact.

## Assignment 2

Due: **Week 11**

Weighting: **15%**

The second assignment tests your understanding of selected networking technologies.

Late submission of the assignment will be accepted, but penalised at the rate of 15% per day late. If you cannot submit assignments on time because of illness or other circumstances, please apply for disruption of studies as soon as possible.

For all 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 has access to any of your work.

On successful completion you will be able to:

- Be aware of different major network technologies including wireless, backbone, wide area networks, and the Internet and, being aware of their properties, be able to evaluate different network designs.

- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## Module Exams

Due: **Various**

Weighting: **60%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

The module examinations ask students to answer conceptual questions about the course material as well as solve simple networking problems. Module exams are run in the first hour of the workshop in which the student is enrolled. Students may only attend module exams in workshops they are enrolled in. In the case a student cannot attend a module exam, a [request for special consideration](#) must be made. Five module examinations are each offered up to three times during semester, the sixth module exam is offered twice during semester. The student's best mark for each module is used in their final mark. Students must demonstrate satisfactory performance in modules 1, 2, 3, 4 and 5 to pass the course. Satisfactory performance is defined as getting 40% or more on at least one of the attempts made for that module. A student's final mark for a module is the maximum mark they achieved in any of the student's attempt for that module. The exam mark for each module is worth 10% of the final mark.

On successful completion you will be able to:

- Enunciate the importance and the role of network protocols including why they are organised into protocol stacks and how protocol stacks function.
- Demonstrate an understanding of IP addressing, routing and subnetting by for example computing routing outcomes and determining effective and actual IP addresses.
- Differentiate among LAN components, and describe and, in particular instances calculate, how MAC addresses, address resolution (as implemented by protocols such as ARP) and the ethernet protocol interact.
- Be aware of different major network technologies including wireless, backbone, wide area networks, and the Internet and, being aware of their properties, be able to evaluate different network designs.
- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## Delivery and Resources

### Classes

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

**Note** that practicals workshops (lab sessions) commence in **week 2**. The week-by-week details of the practical (lab) classes will be available from iLearn.

You should have selected both a Practical\_1 and a Practical\_2 at enrolment. **You must attend the practicals that you are enrolled in.**

## Textbook and Reading Materials

The textbook for this semester is:

- Fitzgerald, J. & Dennis, A, [Business Data Communications and Networking, Thirteenth Edition](#), Wiley, 2017
  - Print: ISBN 978-1-119-57166-7
  - E-Text: ISBN 978-1-119-59525-0

Additional reading that you may find useful for this unit:

- Kurose, J. & Ross, K. Computer Networking: A Top-Down Approach 7th edn, Pearson, 2016
  - [Print](#): ISBN 978-1-292-15359-9
  - [E-Text](#): ISBN 978-1-292-15360-5

## Web Resources

### Unit Websites

Comp247 is administered via [iLearn \(http://ilearn.mq.edu.au/\)](http://ilearn.mq.edu.au/).

This unit outline can be found in the university's [unit guides](#)

### Live Streaming

Digital recordings of lectures may be available. They will be linked from iLearn.

## Technologies Used and Required

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

- HP networking equipment and the Comware network operating system.
- Wireshark Packet Analyzer software.

## General Notes

In this unit, you should do the following:

- Attend lectures, take notes, ask questions.
- Attend your weekly Practical session.
- Ensure that you attend module exams during the first hour of your practical session.
- Read appropriate sections of the text, add to your notes and prepare questions for your

lecturer/tutor.

- 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 recommended reading list.

## Unit Schedule

Tentative teaching schedule, subject to change:

Week	Module Topic	Lecture Topic	Module Exam	Assignments	Reading	Workshop Streams 1-11	Workshop Streams 12-22
1	Networking Fundamentals (NF)	Unit Introduction and Network Foundations			Chapter 1	No Labs	No Labs
2	Networking Fundamentals (NF)	LAN			Chapter 7	Network OS and Command Line	Packet Capture with Wireshark
3	Internetworking and Applications (IA)	Network Layer	NF (30 min)		Chapter 5	Packet Capture with Wireshark	Network OS and Command Line
4	Internetworking and Applications (IA)	Transport and Application Layers			Chapters 2 & 5	IP Headers	IP Headers
5	Hardware Layers (HL)	Data-Link Layer			Chapter 4	Subnetting	Subnetting
6	Hardware Layers (HL)	Physical Layer		Assignment 1	Chapter 3	Switches, MAC, ARP	Transport and Application Layers
7	Campus Networks (CN)	Wireless Networks	NF,IA,HL (60 min)		Chapter 7	Transport and Application Layers	Switches, MAC, ARP
Mid Semester Break							
8	Campus Networks (CN)	Backbone Networks			Chapter 8	Router Configuration	WiFi
9	Network Security (NS)	Security	IA,HL,CN (60 min)		Chapter 11	WiFi	Router Configuration



10	Network Security (NS)	Security			Chapter 11	Virtual LANs	Security
11	WANs and The Internet (WI)	Wide Area Networks	CN,NS (60 min)	Assignment 2	Chapter 9	Security	Virtual LANs
12	WANs and The Internet (WI)	The Internet			Chapter 10	TBD	TBD
13		Tying it all together	NS,WI (60 min)			Catch-up week	Catch-up week
Formal Exam Period			NF,IA,HL,CN,NS,WI (180 min)				

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](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 \(https://students.mq.edu.au/support/study/student-policy-gateway\)](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 \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of

Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@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](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)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](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 outcome**

- Demonstrate technical networking proficiency including demonstrated ability to configure, construct, and document, and in simple cases, design networks, as well as the ability to perform traffic analysis on local area networks.

## **Assessment tasks**

- Practical Workshops
- Assignment 1
- Assignment 2
- Module Exams

## **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**

- Demonstrate technical networking proficiency including demonstrated ability to configure, construct, and document, and in simple cases, design networks, as well as the ability to perform traffic analysis on local area networks.
- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## **Assessment tasks**

- Practical Workshops
- Assignment 2

## **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 outcome

- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## Assessment tasks

- Practical Workshops
- Assignment 2
- Module Exams

## 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

- Enunciate the importance and the role of network protocols including why they are organised into protocol stacks and how protocol stacks function.
- Demonstrate an understanding of IP addressing, routing and subnetting by for example computing routing outcomes and determining effective and actual IP addresses.
- Differentiate among LAN components, and describe and, in particular instances calculate, how MAC addresses, address resolution (as implemented by protocols such as ARP) and the ethernet protocol interact.
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- Demonstrate technical networking proficiency including demonstrated ability to configure, construct, and document, and in simple cases, design networks, as well as the ability to perform traffic analysis on local area networks.
- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## Assessment tasks

- Practical Workshops

- Assignment 1
- Assignment 2
- Module Exams

## 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

- Enunciate the importance and the role of network protocols including why they are organised into protocol stacks and how protocol stacks function.
- Demonstrate an understanding of IP addressing, routing and subnetting by for example computing routing outcomes and determining effective and actual IP addresses.
- Differentiate among LAN components, and describe and, in particular instances calculate, how MAC addresses, address resolution (as implemented by protocols such as ARP) and the ethernet protocol interact.
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- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

### Assessment tasks

- Practical Workshops
- Assignment 1
- Assignment 2
- Module Exams

## 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**

- Demonstrate an understanding of IP addressing, routing and subnetting by for example computing routing outcomes and determining effective and actual IP addresses.
- Differentiate among LAN components, and describe and, in particular instances calculate, how MAC addresses, address resolution (as implemented by protocols such as ARP) and the ethernet protocol interact.
- Be aware of different major network technologies including wireless, backbone, wide area networks, and the Internet and, being aware of their properties, be able to evaluate different network designs.
- Demonstrate technical networking proficiency including demonstrated ability to configure, construct, and document, and in simple cases, design networks, as well as the ability to perform traffic analysis on local area networks.
- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## **Assessment tasks**

- Practical Workshops
- Assignment 1
- Assignment 2
- Module Exams

## **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**

- Enunciate the importance and the role of network protocols including why they are organised into protocol stacks and how protocol stacks function.
- Demonstrate an understanding of IP addressing, routing and subnetting by for example computing routing outcomes and determining effective and actual IP addresses.

- Differentiate among LAN components, and describe and, in particular instances calculate, how MAC addresses, address resolution (as implemented by protocols such as ARP) and the ethernet protocol interact.
- Be aware of different major network technologies including wireless, backbone, wide area networks, and the Internet and, being aware of their properties, be able to evaluate different network designs.
- Demonstrate technical networking proficiency including demonstrated ability to configure, construct, and document, and in simple cases, design networks, as well as the ability to perform traffic analysis on local area networks.
- Be acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## **Assessment tasks**

- Practical Workshops
- Assignment 1
- Assignment 2
- Module Exams

## **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 acutely aware of issues in, and have an ability to develop plans for dealing with, network security and management.

## **Assessment tasks**

- Practical Workshops
- Assignment 2

## **Changes from Previous Offering**

### **Changes since Semester 1 2018**

Weekly exercises have been removed and regular module exams will be offered in place of a

written exam during the final exam period.

## Changes since Semester 1 2017

During previous offerings all practical classes were completed in a specialist networking laboratory. As of 2017 we have reconstructed the practical work to include new material that also uses resources available in standard laboratories, and students will from week to week alternate between the normal computing laboratories and the specialist networking lab. Many modern networking tools are now designed to run on standard computing equipment.

During 2017 the unit was run, unusually, with no hurdle assessments. As of 2018 year the hurdles have been reinstated.

## Grading

### Grading

At the end of the semester, you will receive a grade that reflects your achievement in the unit

- **Fail (F)**: does not provide evidence of attainment of all learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; and incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.
- **Pass (P)**: provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; and communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
- **Credit (Cr)**: provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; plus communication of ideas fluently and clearly in terms of the conventions of the discipline.
- **Distinction (D)**: provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.
- **High Distinction (HD)**: provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or



problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application.

In this unit, the final mark will be calculated by combining the marks for all assessment tasks according to the percentage weightings shown in the assessment summary. The module examination component in this unit is a hurdle requirement; you must get a mark of at least 40% in each of module exams 1 through 5 inclusive in order to pass the unit. The practical classes are also a hurdle assessment, you will be required to perform to a satisfactory standard in at least eight of the practical classes to pass the unit.

Concretely, **in order to pass the unit**, you must obtain an overall total mark of 50% or higher, a mark of 40% or higher in the first five of the six module exams, and satisfactorily complete at least 8 out of the 12 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 to obtain High Distinction;
  - have a total mark of 75% or higher to obtain Distinction;
  - have a total mark of 65% or higher to obtain Credit.

## Changes since First Published

Date	Description
14/02/2019	ISBN numbers for both printed and e-book editions of the text added. Also, the publication date for the proscribed text has been corrected.