Introduction to Computer Science

Lecturer Guide

Modification History

Version	Date	Revision Description
V1.0	February 2017	Replaces Introduction to Computing

CONTENTS

1 Unit Overview and Objectives

This unit aims to provide a sound knowledge and understanding of fundamental computer science topics. It covers the fundamental concepts relating to a wide range of computer hardware and software, the characteristics of hardware components, how data, images and sound are represented in a computer system, the fundamental concepts of computer networks, and cultural, ethical and legal issues related to computing.

2 Learning Outcomes and Assessment Criteria

Learning Outcomes; The Student will:	Assessment Criteria; The Student can:
1. Understand fundamental concepts relating to hardware and software	1.1 Describe the functions of a computer system 1.2 Describe a range of computer systems or justify the use of a type of computer system for a particular purpose 1.3 Define the term 'hardware' 1.4 Describe the purpose or characteristics of computer hardware 1.5 Define the term 'software' 1.6 Identify categories of software 1.7 Describe types of application software or justify the use of application software for a particular purpose 1.8 Describe types of system software or justify the use of system software for a particular purpose 1.9 Describe types of utility software or justify the use of utility software for a particular purpose

2. Understand the characteristics of hardware components	2.1 Describe internal components of computer hardware 2.2 Describe the components of a central processing unit (CPU) 2.3 Describe the functions of a CPU 2.4 Explain the function of the fetch-decode-execute cycle 2.5 Describe how hardware components communicate with each other 2.6 Identify units of measurements of computer storage 2.7 Describe a range of computer storage media or justify the use of a type of storage media for a particular purpose 2.8 Describe a range of input devices or justify the use of a type of input device for a particular purpose 2.9 Describe a range of output devices or justify the use of an output device for a particular purpose
3. Understand how data is represented in a computer system	3.1 Describe how data is represented by binary 3.2 Describe how data is represented by ASCII 3.3 Describe how data is represented by Unicode 3.4 Explain how encryption can be used to represent data 3.5 Explain how compression can facilitate the storage and transmission of data 3.6 Explain the purpose of number systems 3.7 Explain the binary number system 3.8 Demonstrate addition or subtraction of binary numbers 3.9 Demonstrate an understanding of two's complement 3.10 Explain the hexadecimal number system 3.11 Demonstrate conversion between decimal, binary or hexadecimal numbers 3.12 Describe how images are represented in a computer system 3.13 Describe how sound is represented in a computer system 3.14 Explain how compression can facilitate storage and transmission of images or sound 3.15 Define the term 'digital logic' 3.16 Explain the purpose and operation of logic gates

4. Understand the fundamental concepts of computer networks	4.1 Explain the purpose of a computer network 4.2 Describe types of computer network or explain the criteria for selecting a particular type of network 4.3 Describe the hardware used in a computer network 4.4 Describe the software used in a computer network 4.5 Describe the transmission media used in a computer network 4.6 Describe types of network transmission protocols 4.7 Describe types of computer network topology or justify the use of a topology for a particular purpose 4.8 Describe Internet and World Wide Web technologies 4.9 Discuss computer network issues
5. Understand cultural, ethical and legal issues relating to computing	5.1 Explain what a cultural issue is 5.2 Describe a range of cultural issues 5.3 Explain how cultural issues can be addressed 5.4 Explain what an ethical issue is 5.5 Describe a range of ethical issues 5.6 Explain how ethical issues can be addressed 5.7 Identify laws and guidelines that relate to computing 5.8 Describe situations where laws and guidelines have been used to deal with people using computers to commit crimes or cause offence

3   Syllabus

Syllabus			
Topic No	**Title**	**Breakdown of learning hours**	**Content**
1	Introduction to Computer Systems and Hardware	2 hours of lectures 1 hour of laboratory 2 hours of tutorials 4 hours of private study	• Definition of computer system • Functions of a computer system • Data and information • An overview of a typical computer system • Types of computer systems • Big data • The Internet of Things • Definition of hardware • The role of computer hardware • Types of computer hardware • Accessibility **Learning Outcome: 1**

2	Introduction to Application Software and System Software	2 hours of lectures
		1 hour of laboratory
		2 hours of tutorials
		4 hours of private study
			• Definition of software
			• Categories of software
			• Software compatibility
			• Types and uses of application software
			• How to obtain software
			• Software licences
			• Criteria to consider when selecting application software
			• System software
			  - operating system software
			  - utility software
			  - driver software
			• Criteria to consider when selecting system software
			
			Learning Outcome: 1

3	Internal Components of Computer Hardware	2 hours of lectures 1 hour of laboratory 2 hours of tutorials 4 hours of private study	• Internal components: Motherboard, chips, central processing unit (CPU), clock, memory, chipset, expansion slots and cards, power supply, fan, buses, connectors • How components communicate with each other • How components communicate with external devices **Learning Outcomes: 2**
4	Computer Processors	1 hour of lectures 1 hour of laboratory 1 hour of tutorials 2 hours of private study	• The role of a computer processor • Types of processor • Components of a CPU • The functions of a CPU • How components of a CPU communicate with each other • The fetch-execute-decode cycle **Learning Outcome: 2**

5	Storage Devices and Input and Output Devices	2 hours of lectures 1 hour of laboratory 2 hours of tutorials 4 hours of private study	• Computer storage • Units of measurement of computer storage • Computer storage media • Storage locations • Criteria to consider when selecting computer storage • Input devices • Criteria to consider when selecting input devices • Output devices: • Criteria to consider when selecting output devices **Learning Outcome: 2**
6	Data Representation	1 hour of lectures 1 hour of laboratory 1 hour of tutorials 2 hours of private study	• Binary representation of data • ASCII representation of data • Unicode representation of data • Hexadecimal representation of data • Definitions of encryption and decryption • Examples of encryption • Definition of compression • Compression of data **Learning Outcome: 3**
7	Number Representation	2 hours of lectures 1 hour of laboratory 2 hours of tutorials 4 hours of private study	• Number systems • Decimal number system • Binary number system • Why consider number systems? • Addition of binary numbers • Subtraction of binary numbers • Two's complement • Hexadecimal number system • Converting decimal, binary and hexadecimal numbers **Learning Outcome: 3**

8	Image and Sound Representation	2 hours of lectures 1 hour of laboratory 2 hours of tutorials 4 hours of private study	• Image representation • Image file formats • Compression of images • Sound representation • Sound file formats • Compression of sound **Learning Outcome: 3**

9	Digital Logic	1 hour of lectures
		1 hour of laboratory
		1 hour of tutorials
		2 hours of private study
			• Digital logic
			• Truth Tables
			• Logic gates
			  - AND
			  - OR
			  - NOT
			  - NAND
			  - NOR
			
			Learning Outcome: 3

10	Computer Networks	2 hours of lectures 1 hour of laboratory 2 hours of tutorials 4 hours of private study	• Definition of a computer network • Types of network • Criteria for selecting a network • Network hardware • Network transmission media • Network transmission protocols • Network software **Learning Outcome: 4**
11	Network Topologies and the Internet	2 hours of lectures 1 hour of laboratory 2 hours of tutorials 4 hours of private study	• Define a network topology • Types of topology • Criteria for selecting a topology • Definition of the Internet • Definition of the World Wide Web (WWW) • World Wide Web technologies • Computer network issues **Learning Outcome: 4**

12	Cultural, Ethical and Legal Issues Relating to Computing	3 hours of lectures
		1 hour of laboratory
		3 hours of tutorials
		6 hours of private study
			• Definition of cultural issues
			• Examples of cultural issues
			• Addressing cultural issues
			• Definition of ethical issues
			• Examples of ethical issues
			• Addressing ethical issues
			• UK laws and guidelines
			  - Data Protection Act (1998)
			  - Computer Misuse Act (1990)
			  - Copyright, Designs and Patents Act (1988)
			• Global laws and computers
			• Examples of situations where the law has been applied
			
			Learning Outcome: 5

4 Resources

Lecturer Guide: This guide contains notes for lecturers on the organisation of each topic, and suggested use of the resources. It also contains all of the suggested exercises.

PowerPoint slides: These are presented for each topic for use in the lectures. They contain many examples which can be used to explain the key concepts. Handout versions of the slides are also available.

Student Guide: This contains the topic overviews and all of the suggested exercises.

5 Pedagogic Approach

Suggested Learning Hours					
Lectures:	**Tutorial:**	**Seminar:**	**Laboratory:**	**Private Study:**	**Total:**
22	22	-	12	44	100

The teacher-led time for this module is comprised of lectures and tutorials. The breakdown of the hours is also given at the start of each topic.

5.1 Lectures

Lectures are designed to start each topic and PowerPoint slides are presented for use during these sessions. Students should also be encouraged to be active during this time and to discuss and/or practice the concepts covered. Lecturers should encourage active participation wherever possible.

5.2 Tutorials

These are designed to deal with the questions arising from the lectures and private study sessions and will focus on the completion of a range of exercises to reinforce learning achieved through the lecture and private study sessions.

5.3 Seminars/Laboratory Sessions

In these sessions, students are required to work through various exercises. The details of these are provided in the Student Guide for this unit. Each student must have a copy of the ITCS Student Guide and must be instructed to bring it to the lessons for the unit.

5.4 Private Study

The Student Guide also contains details of the Private Study exercises. Students are expected to revise the content of lectures and complete these exercises to improve their understanding. Teachers will need to set time frames for the completion of exercises and go over the suggested answers with students. No answers are given in the student guide. Completion deadlines should ideally be prior to the scheduled tutorial for each topic, as there is time allowed during this session for the review of answers.

There are some references to websites throughout these materials and further online sources of information can be found on the NCC Education Campus (http://campus.nccedu.com). Teachers may also choose to substitute their own examples wherever they feel it is appropriate.

6 Assessment

This module will be assessed by means of an examination, based on the assessment criteria given above. Students will be expected to demonstrate that they have met the unit's learning outcomes.

Topic 1: Introduction to Computer Systems and Hardware

1.1 Learning Objectives

This topic provides an overview of computer systems and computer hardware.

On completion of the topic, students will be able to:

- Describe the functions of a computer system
- Describe a range of computer systems or justify the use of a type of computer system for a particular purpose
- Define the term *hardware*
- Describe the purpose or characteristics of computer hardware

1.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial sessions.

1.3 Timings

Lectures:	2 hours
Seminars:	0 hours
Laboratory Sessions:	1 hour
Private Study:	4 hours
Tutorials:	2 hours

1.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One
    - o Definition of a computer system
    - o Functions of a computer system
    - o Data and information
    - o An overview of a typical computer system
    - o Types of computer systems
    - o Big data
    - o The Internet of Things
- Lecture Two
    - o Definition of hardware
    - o The role of computer hardware
    - o Types of computer hardware
    - o Accessibility

1.4.1 Guidance on the Use of the Slides

Lecture One – 1 hour

Slide 1:   This slide introduces Topic One. You should inform the students that the topic will be presented in two lectures.

Slide 2:   This slide states the areas that Topic One will cover. You can explain that the functions of a computer system and types of computer systems will be covered in Lecture One and the role of computer hardware, types of computer hardware and accessible computer hardware will be covered in Lecture Two.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lectures and tutorials for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   Inform the students that this is the first slide of **Lecture One**. This slide provides a definition of the term *computer system*. You might want to try and elicit the students' ideas about this before you reveal the definition to them.

Slide 6:   This slide reinforces in a simple diagram the basic elements that make up a computer system and the interaction between each element.

Slide 7:   This slide states examples of computer hardware that are part of a computer system. You might want to try and elicit the students' ideas about these before you reveal the examples to them. It is suggested that you inform the students that hardware will be explored in further in lecture two and in detail in Topics Three, Four and Five.

Slide 8:   This slide states examples of software that are part of a computer system. You might want to try and elicit the students' ideas about these before you reveal the examples to them. It is suggested that you inform the students that software will be explored in further detail in Topic Two.

Slide 9:   This slide provides a definition of the term *data*. Examples of data are stated and you might want to try and elicit the students' ideas about these before you reveal the examples to them. You might also want to encourage them to suggest further examples of data to reinforce their understanding.

Slide 10:   This slide provides a definition of the term *information*. Examples of information are stated and you might want to try and elicit the students' ideas about these before you reveal the examples to them. You might also want to encourage them to suggest further examples of information to reinforce their understanding.

Slide 11:   This slide states the functions of a computer system. You might want to try and elicit the students' ideas about this before you reveal the functions to them.

Slide 12:   This slide illustrates in a simple diagram the basic functions of a computer system.

Slide 13:   This slide explains the role that the input of data plays in a computer system. It is suggested that you inform the students that input devices will be explored in further detail in Topic Five.

Slide 14:   This slide explains the role of processing in a computer system. It is suggested that you inform the students that the role of the processor and types of processors will be explored in further detail in Topic Four.

Slide 15:   This slide explains the role of storage in a computer system. It is suggested that you inform the students that storage will be explored in further detail in Topic Five.

Slide 16:   This slide explains the role of output in a computer system. It is suggested that you inform the students that output will be explored in further detail in Topic Five.

Slide 17:   This slide illustrates in a diagram an overview of a computer system that uses a laptop. You might want to try and elicit the students' ideas about additional ways that input and output could be performed.

Slide 18:   This slide reinforces knowledge of the components in a computer system. You might want to elicit the students' knowledge about this before you reveal the components to them.

Slide 19:   This slide explains how a computer system can be categorized according to criteria such as its application, size and power.

Slide 20:   This slide states the application of four types of computer systems. You might want to try and elicit the students' ideas about general purpose and embedded systems and ask them to suggest examples of each type.

Slide 21:   This slide discusses the size of computers, from the largest to the smallest. You might want to try and elicit the students' ideas about this before you reveal each type. It is suggested that you inform the students that servers will be explored in further detail in Topics Ten and Eleven.

Slide 22:   This slide emphasizes the importance of the power of a computer system. You could inform the students of the importance of the microprocessor in this and that this will be looked at in more detail in Topic Four. The term *quantum computer* is introduced. It is suggested that you direct the students to read more about this exciting development and indicate the article on slide 27, *Google's new quantum computer is '100 million times faster than your PC'.*

Slide 23:   This slide states examples of users of computer systems. You might want to try and elicit the students' ideas about this before you reveal each example.

Slide 24:   This slide explains the term *big data.* You might want to ask the students to suggest examples of organisations that produce big data

Slide 25:   This slide explains the term the *Internet of Things (IoT).* It is suggested that you direct the students to read more about this and indicate the article on slide 27, *An engineer uses IoT to tackle illness.*

Slide 26:   This slide summarises the main points of the first lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 27:   This slide recommends references/websites that the students can access for further information on the subject content discussed in the first lecture. You can inform students that this is the last slide of Lecture One.

Lecture Two – 1 hour

Slide 28:   Inform the students that this is the first slide of **Lecture Two**. This slide provides a definition of the term *computer hardware*. Examples of information are stated and you might want to try and elicit the students' ideas about this before you reveal the definition to them.

Slide 29:   This slide states the three main types of computer hardware.

Slide 30:   This slide explains the role of computer hardware in a computer system. You might want to try and elicit the students' ideas about this before you reveal the types to them.

Slide 31:   This slide states the purpose of main internal hardware components.

Slide 32:   This slide describes the main types of internal hardware components. You might want to try and elicit the students' ideas about this before you reveal the types to them. It is suggested that you inform the students that internal hardware will be explored in further detail in Topics Three and Four.

Slide 33:   This slide states the role that external hardware plays in a computer system. It is suggested that you inform the students that external hardware will be explored in further detail in Topic Five.

Slide 34:   This slide defines the term *peripheral device* and provides examples of external devices. You might want to try and elicit the students' ideas about these before you reveal the examples to them.   It is suggested that you inform the students that peripheral devices will be explored in further detail in Topic Five.

Slide 35:   This slide provides examples of removable storage devices. You might want to try and elicit the students' ideas about these before you reveal the examples to them. You should check that the students understand the terms *port* and *drive*. It is suggested that you inform the students that storage devices will be explored in further detail in Topic Five.

Slide 36:   This slide explains what is meant by the term *wearable hardware* and introduces the students to this aspect of hardware.

Slide 37:   This slide provides examples of wearable computer hardware. You might want to try and elicit the students' ideas about these before you reveal the examples to them.

Slide 38:   This slide defines the term *accessibility of computer hardware.* You might want to try and elicit the students' ideas about these before you reveal the examples to them. It is suggested that you emphasize the importance of this consideration of hardware. It is recommended that you refer students to the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD). The UNCRPD states in Articles 9 and 21 that access to information, communications and services, including the Internet, is a human right.

Slide 39:   This slide describes the need for accessible computer hardware.

Slide 40:   This slide provides examples of accessible hardware. You might want to try and elicit the students' ideas about these before you reveal the examples to them.

Slide 41:   This slide states criteria that should be applied when choosing hardware. It is suggested that you inform the students that they will be given opportunities to apply these criteria when they research, select and justify what hardware should be used for particular users.

Slide 42:   This slide summarises the main points of the second lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of subject content in the reading recommended on the next slide.

Slide 43:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the second lecture.

Slide 44:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the two tutorials for this topic.

1.5   Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

For Exercises 1, 2 and 3, encourage students to complete as much of the tasks as possible from their existing knowledge and understanding before they research further information.

You will need to allow time for feedback and discussion on each exercise.

Encourage students to take notes of correct answers suggested by other students.

Exercise 1: Using Computer Systems

a)   Describe the type/s of computer systems you use regularly, e.g. stand-alone, network, general purpose, embedded.

b)   State where you use these systems.

c)   Explain what sort of tasks you use them for.

d)   Describe any data that is input and processed by the computer systems.

e)   Describe the information that is output by the computer systems.

Suggested Answer:

Answers will be varied for each question.

a)   Possible answers could include: stand alone, network, general purpose and embedded systems. Answers should be specific when referring to general purpose and embedded, that is, what type of general purpose system, e.g. a laptop, etc. and what type of embedded system, e.g. a microwave, etc.

b)   Possible answers could include: home, school, college, work, friends, family, while shopping, etc.

c)   Possible answers could include: school or college work, games, listening to music, communicating with family and friends, using social media, work tasks, banking, online shopping, if embedded a range of activities, e.g. washing clothes, cooking, taking photographs, etc.

d)   Possible answers could include: financial data, transaction data when making a purchase, personal data, temperature, etc.

e)   Possible answers could include: reports, receipts, wage slips, warm food, etc.

Exercise 2: Users and computer systems

Complete the table below by inserting the types of computers that each user working at an organisation might access during their work. An example has been provided for you.

TYPE OF USER	TYPE OF COMPUTERS
Someone working at a small business (less than ten employees)	Server, desktop, laptop, notebook, smartphone
Someone working at a large business (over one hundred employees)	
A scientist working at a university undertaking scientific research	
A receptionist at a surgery	
A person working at home	
An employee at a pharmaceutical company undertaking drug research	
An airline booking representative	
An administration assistant at a cinema	
A manager at an electricity company	

A researcher at a defence institution	
A journalist	
An administrator at a hospital	
A teacher at a school or college	
A manager at a national supermarket chain	
A stockbroker	
A weather forecaster of a national weather forecasting organisation	

Suggested Answer:

TYPE OF USER	TYPE OF COMPUTERS
Someone working at a small business (less than ten employees)	Server, desktop, laptop, notebook, smartphone
Someone working at a large business (over one hundred employees)	Mainframe, server, desktop, laptop, notebook, smartphone
A scientist working at a university undertaking scientific research	Supercomputer, mainframe, server, desktop, laptop
A receptionist at a surgery	Server, desktop, laptop
A person working at home	Server, desktop, laptop, netbook, notebook, smartphone
An employee at a pharmaceutical company undertaking drug research	Supercomputer, mainframe, server, desktop, laptop
An airline booking representative	Mainframe, server, desktop, laptop, notebook
An administration assistant at a cinema	Server, desktop, laptop, notebook
A manager at an electricity company	Mainframe, server, desktop, laptop, notebook
A researcher at a defence institution	Supercomputer, mainframe, server, desktop, laptop
A journalist	Server, desktop, laptop, netbook, notebook, smartphone
An administrator at a hospital	Server, desktop, laptop, notebook
A teacher at a school or college	Server, desktop, laptop, notebook
A manager at a national supermarket chain	Mainframe, server, desktop, laptop, notebook
A stockbroker	Server, desktop, laptop, netbook, notebook, smartphone
A weather forecaster of a national weather forecasting organisation	Supercomputer, mainframe, server, desktop, laptop

Exercise 3: The functions of computer systems

It is important to understand the functions of a computer system. Consider the following three computer systems and their users. For each user, identify data that they might input to the system, information that they may need output and information that will need to be stored. Complete the table below with your answers:

a) Doctor at a surgery	DATA INPUT
	INFORMATION OUTPUT
	INFORMATION STORED
b) Administrator at a college	DATA INPUT
	INFORMATION OUTPUT
	INFORMATION STORED
c) Coffee shop manager	DATA INPUT
	INFORMATION OUTPUT
	INFORMATION STORED

Suggested Answer:

a) Doctor at a surgery	DATA INPUT Patient's temperature, weight, blood pressure, medication data for prescriptions, etc.
	INFORMATION OUTPUT Patient's records, prescriptions, etc.
	INFORMATION STORED Patient's records, details of medication, stock records, details of appointments, details of meetings, etc.
b) Administrator at a college	DATA INPUT Student's personal data, student's contact data, examination data, etc.

	INFORMATION OUTPUT Student records, course details, timetables, examination reports, etc.
	INFORMATION STORED Student records, details of courses, timetables, examination results, etc.
c) Coffee shop manager	**DATA INPUT** Staff personal data, staff financial data, staff work rotas, sales data, stock data, etc.
	INFORMATION OUTPUT Staff records, staff reports, stock reports, sales reports, etc.
	INFORMATION STORED Staff records, staff reports, stock reports, sales reports, etc.

Exercise 4: Big data

The amount of data that is being used and stored globally is growing at a rapid rate. Research and describe at least four benefits and at least four limitations of big data.

Suggested Answer:

Advantages

Aids forecasting of customer needs

When analysed it can reveal patterns and trends

Enables an organisation to remain competitive

Can improve customer relations

Can aid decision making

Can help to reduce risks

Can increase efficiency in an organisation

<u>Disadvantages</u>

Storing, querying, and maintaining big data can be expensive

Storage problems – not enough

Systems not fast enough to process the data

Can be time consuming

Security issues

Privacy issues

Ethical issues

1.6   Private Study

The time allocation for private study in this topic is expected to be 4 hours.

Lecturers' Notes:

Students have copies of the private study exercises in the Student Guide. Students are also expected to use private study time to revise the content of the Topic One and come to the tutorial with any questions or queries.

Exercise 1: The Internet of Things

Read the following article: *An engineer uses IoT to tackle illness*, Patrick Thibodeau, Computerworld, Aug 8, 2016

http://www.computerworld.com/article/3105585/internet-of-things/an-engineer-uses-iot-to-tackle-illness.html

Research two other areas, other than health, that could benefit from the Internet of Things. During your research, make a note of the computer systems and hardware that are used.

Exercise 2: Wearable hardware

Describe at least four advantages and at least four disadvantages of wearing computer hardware.

Exercise 3: Accessible computer hardware

Research two people whose lives have been improved by the use of assistive technology. Make notes on the hardware that they use and how it helps them.

The following website will help you.

http://www.huffingtonpost.co.uk/kim-lawther/how-technology-is-transforming-disabled-peoples-lives_b_9479556.html

1.7 Tutorial Notes

The time allowance for tutorials in this topic is 2 hours.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

1.7.1 Review of Private Study Exercises

Exercise 1: The Internet of Things

Read the following article: *An engineer uses IoT to tackle illness*, Patrick Thibodeau, Computerworld, Aug 8, 2016

http://www.computerworld.com/article/3105585/internet-of-things/an-engineer-uses-iot-to-tackle-illness.html

Research two other areas, other than health, that could benefit from the Internet of Things. During your research, make a note of the computer systems and hardware that are used.

Suggested Answer:

Answers will vary but can include:

- Cities

- The environment

- Farming

- Homes

- Agriculture

- Industries

- Retail

- Security

- Logistics

- Water

Exercise 2: Wearable hardware

Describe at least four advantages and at least four disadvantages of wearing computer hardware.

Suggested Answer:

Advantages

User is freer to move around

Can be tracked

Not easy to lose

Can be applied to a number of application areas

More easy to use

Can act as a gateway to the Internet of Things (IoT)

Disadvantages

Can be tracked

Easy to lose

Can be damaged through impact or contact with water

Can cause discomfort

Can be expensive

Charging devices is a problem at present

Exercise 3: Accessible computer hardware

Research two people whose lives have been improved by the use of assistive technology. Make notes on the hardware that they use and how it helps them.

The following website will help you.

http://www.huffingtonpost.co.uk/kim-lawther/how-technology-is-transforming-disabled-peoples-lives_b_9479556.html

Suggested Answer:

Answers will vary but students should present information on two people, the hardware that they use and what they use it for.

Topic 2: Introduction to Application Software and System Software

2.1 Learning Objectives

This topic provides an overview of application software and system software.

On completion of the topic, students will be able to:

- Define the term 'software'
- Identify categories of software
- Describe types of application software
- Justify the use of application software for a particular purpose
- Describe types of system software
- Justify the use of system software for a particular purpose
- Describe types of utility software
- Justify the use of utility software for a particular purpose

2.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

2.3 Timings

Lectures: 2 hours

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 4 hours

Tutorials: 2 hours

2.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One
    - o Definition of software
    - o Categories of software
    - o Software compatibility
    - o Types and uses of application software
    - o How to obtain software
    - o Software licences
    - o Criteria to consider when selecting application software
- Lecture Two
    - o System software
    - o Operating system software
    - o Utility software
    - o Driver software
    - o Criteria to consider when selecting system software

2.4.1 Guidance on the Use of the Slides

Lecture One – 1 Hour

Slide 1:   This slide introduces Topic Two. You should inform the students that the topic will be presented in two lectures.

Slide 2:   This slide states the areas that Topic Two will cover. You can explain that Lecture One will focus on the different categories of software, application software and how software can be obtained and system software will be covered in Lecture Two.

Slide 3 & 4: These slides state the learning outcomes for this topic.

Slide 5:   Inform the students that various terminology will be referred to and explained in the lectures and tutorials for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 6:   Inform the students that this is the first slide of **Lecture One**. This slide defines the meaning of software and makes reference to Topic One when the term was first discussed. You could ask the students to define software before you reveal the definition to them.

Slide 7:   This slide illustrates some lines of code from a program (PHP if the students ask).

Slide 8:   This slide reveals the two types of software that will be discussed in the lecture.

Slide 9:   This slide illustrates the main types of applications software and the main types of systems software.

Slide 10:   This slide discusses the various ways that software can be obtained. You might want to try and elicit the students' ideas about this before you reveal each point to them.

Slide 11:   This slide discusses what is meant by integrated software. You might want to try and elicit the students' ideas about this before you reveal the explanation to them and also ask them for examples of application software that they have used.

Slide 12:   This slide provides a definition of application software.

Slide 13:   This slide provides examples of application software that is used for work. You could ask the students for their examples before you reveal the slide examples to them.

Slide 14:   This slide provides further examples of the use of application software for work purposes.

Slide 15:   This slide provides examples of application software that is used for communications. You could ask the students for their examples before you reveal the slide examples to them.

Slide 16:   This slide provides examples of application software that is used for leisure. You could ask the students for their examples before you reveal the slide examples to them.

Slide 17:   This slide reveals how some application software can be used in different types of categories.

Slide 18:   This slide provides information on different types of software licences.

Slide 19:   This slide provides information on software licence agreements.

Slide 20:   This slide explains the criteria that should be considered when selecting application software. You might want to try and elicit the students' ideas about this before you reveal each criterion to them.

Slide 21:   This slide summarises the main points of the first lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 22:   This slide recommends references/websites that the students can access for further information on the subject content discussed in the first lecture. You can inform students that this is the last slide of Lecture One.

Lecture Two – 1 Hour

Slide 23:   This is the first slide of **Lecture Two** and provides a definition of systems software. You might want to try and elicit the students' ideas about this before you reveal the definition to them.

Slide 24:   This slide discusses the purpose of operating system software.

Slide 25:   This slide discusses the functions of operating system software.

Slide 26:   This slide discusses the categories of operating system software.

Slide 27:   This slide states the names of commonly used operating system software. You might want to ask the students if they can provide examples before you reveal the names to them.

Slide 28:   This slide reveals further examples of operating system software.

Slide 29:   This slide provides examples of open-source and closed-source operating system software. You might want to check the students' understanding of the two types.

Slide 30:   This slide explains that types of operating system software is compatible with certain types of computer system. You might want to elicit the students' ideas about this before you reveal the examples to them

Slide 31:   This slide states examples of types of operating system interfaces. You might want to ask the students if they can provide examples before you reveal the examples to them.

Slide 32:   This slide provides some information on a graphical user interface.

Slide 33:   This slide provides some information on a touch screen interface.

Slide 34:   This slide provides some information on a voice recognition interface. You might want to ask the students if they use or have used this type of interface and of so, for what purpose.

Slide 35:   This slide provides some information on a command line interface.

Slide 36:   This slide states the main purpose of utility software.

Slide 37:   This slide states examples of utility software. You might want to elicit the students' examples before you reveal the examples to them.

Slide 38:   This slide explains what is meant by driver software.

Slide 39:   This slide states examples of driver software. You might want to ask the students if they can provide examples before you reveal the examples to them.

Slide 40:   This slide explains the criteria that should be considered when selecting application software. You might want to try and elicit the students' ideas about this before you reveal each criterion to them.

Slide 41:   This slide summarises the main points of the second lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of subject content in the reading recommended on the next slide.

Slide 42:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the second lecture.

Slide 43:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the two tutorials for this topic.

2.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Two

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

2.6 Private Study

The time allocation for private study in this topic is expected to be 4 hours.

Lecturers' Notes:
Students have copies of the private study exercises in the Student Guide.

Exercise 1: Using software

Identify the type/s of application and systems software that you use regularly.
Explain what sort of tasks you use each type for

Exercise 2: Obtaining software

Describe the advantages and disadvantages of the following methods of obtaining software.

- Closed source/proprietary/commercial/off-the-shelf/packaged
- Open source software (OSS)/public domain
- Custom/bespoke/tailored
- Software as a Service (SaaS)/on-demand software
- Freeware
- Shareware
- In-app purchase

Exercise 3: Operating systems

Research the following operating systems, find three facts about each type and document your information.

- Windows
- OS X
- Linux
- Android
- iOS

Exercise 4: Touch screens

Describe the advantages and disadvantages of touch screen interfaces.

2.7 Tutorial Notes

The time allowance for tutorials in this topic is 2 hours.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

2.7.1 Review of Private Study Exercises

Exercise 1: Using software

Identify the type/s of application and systems software that you use regularly.

Explain what sort of tasks you use each type for

Suggested Answer:

Reference should be made to various application software, such as word processing, spreadsheet, database, etc. Reference should also be made to system software and operating software; some students might also refer to utility software.

Exercise 2: Obtaining software

Describe the advantages and disadvantages of the following methods of obtaining software.

- Closed source/proprietary/commercial/off-the-shelf/packaged

- Open source software (OSS)/public domain

- Custom/bespoke/tailored

- Software as a Service (SaaS)/on-demand software

- Freeware

- Shareware

- In-app purchase

Suggested Answer:

Software	Advantages	Disadvantages
Closed source	Support for the product	Can be expensive Can contain bugs
Open source	Free Upgrades available Can be modified	Less support Can be less user friendly Might not be secure
Custom/bespoke/tailored	Contains specific	Can be expensive
Software as a Service (SaaS)/on-demand software	Less expensive Upgrades	Ties to a contract if want to change
Freeware	Free	Might not be secure
Shareware	Inexpensive	Might not be secure
In-app purchase	Mobile	Might not be secure

Exercise 3: Operating systems

Research the following operating systems, find three facts about each type and document your information.

- Windows
- OS X
- Linux
- Android
- iOS

Suggested Answer:

The students should make reference to:

Ease of use

Compatibility with hardware

Interface

Security

Upgrades

Mobility

Exercise 4: Touch screens

Describe the advantages and disadvantages of touch screen interfaces.

Suggested Answer:

Advantages	Disadvantages
Intuitive	May be difficult to use for some users
Easy to use	Easy to lose, drop, scratch – durability can be questioned
Space-saving	
Mobile	
Flexible	

Topic 3: Internal Components of Computer Hardware

3.1 Learning Objectives

This topic provides an overview of the internal components of computer hardware.

On completion of the topic, students will be able to:

- Describe internal components of computer hardware
- Describe how hardware components communicate with each other
- Understand how components communicate with external devices

3.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

3.3 Timings

Lectures: 2 hours

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 4 hours

Tutorials: 2 hours

3.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One
  - o An investigation of the internal components of a computer system
- Lecture Two
  - o How components communicate with each other
  - o How components communicate with external devices

3.4.1 Guidance on the Use of the Slides

Lecture One – 1 Hour

Slide 1:   This slide introduces Topic Three. You should inform the students that the topic will be presented in two lectures.

Slide 2:   This slide states the areas that Topic Two will cover. You can explain that Lecture One will focus on the purpose, function and location of internal hardware components of a computer system and discussion of some of the methods that can be used to connect the components referred to in Lecture one will be covered in Lecture Two.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that this is the first slide of **Lecture One**. This slide states examples of internal components of computer hardware. You might want to try and elicit the students' ideas about this before you reveal the definition to them.

Slide 5:   This slide provides information on a motherboard. It reveals the terms transistors, capacitors and resistors. You should explain that the three terms refer to electronic components that will not be discussed further but that it is sufficient to know that a *transistor* is a minute, electronic switch, a *resistor* is an electronic component that limits the flow of electrical current in a circuit and a *capacitor* stores an electronic charge.

Slide 6:   This slide reveals the main components of a motherboard.

Slide 7:   This slide discusses the main purpose of a motherboard.

Slide 8:   This slide introduces the central processing unit (CPU). You can explain that there will be further discussion of CPUs in Topic Four.

Slide 9: This slide provides information on a clock. The terms megahertz and gigahertz are introduced.

Slide 10: This slide states the main types of memory chips. You could ask the students if they can provide examples before you reveal the slide examples to them.

Slide 11: This slide provides an explanation of random access memory (RAM).

Slide 12: This slide provides examples of types of RAM. You could ask the students if they can provide examples before you reveal the slide examples to them.

Slide 13: This slide provides an explanation of virtual memory.

Slide 14: This slide provides an explanation of ROM. You could ask the students for their examples before you reveal the slide examples to them. You should explain that some ROM is programmable – *PROM; EPROM* refers to ROM that is erasable and reusable and *EEPROM* refers to a type of PROM that can be erased by exposing it to an electrical charge.

Slide 15: This slide provides information on firmware.

Slide 16: This slide provides information on CMOS.

Slide 17: This slide provides information on what is meant by a *chipset*. It introduces the *northbridge* chip and the *southbridge* chip.

Slide 18: This slide provides information on expansion slots.

Slide 19: This slide explains the migration of functions from expansion cards to chipsets.

Slide 20: This slide makes reference to the power supply. The terms *transformer* and *voltage* are introduced, you can explain that a transformer transfers electrical energy between two or more circuits and voltage refers to the difference in energy between two points on a circuit.

Slide 21: This slide explains the purpose of a fan.

Slide 22: This slide summarises the main points of the first lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 23: This slide recommends references/websites that the students can access for further information on the subject content discussed in the first lecture. You can inform students that this is the last slide of Lecture One.

Lecture Two – 1 Hour

Slide 24: This slide introduces the role of buses in a computer.

Slide 25:   This slide explains the purpose of buses in a computer.

Slide 26:   This slide expands on the purpose of buses. You can explain that buses will be explained in further detail in Topic 4.

Slide 27:   This slide explains the three main types of bus.

Slide 28:   This slide explains the features of a bus.

Slide 29:   This slide states various types of connectors. You can explain that an exercise will be set on connectors to be discussed in the tutorial.

Slide 30:   This slide provides information on USB connectors.

Slide 31:   This slide provides information on firewire connectors.

Slide 32:   This slide summarises the main points of the second lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of subject content in the reading recommended on the next slide.

Slide 33:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the second lecture.

Slide 34:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the two tutorials for this topic.

3.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Three

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term.

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

3.6 Private Study

The time allocation for private study in this topic is expected to be 4 hours.

Lecturers' Notes:

Students have copies of the private study exercises in the Student Guide.

Exercise 1: The motherboard
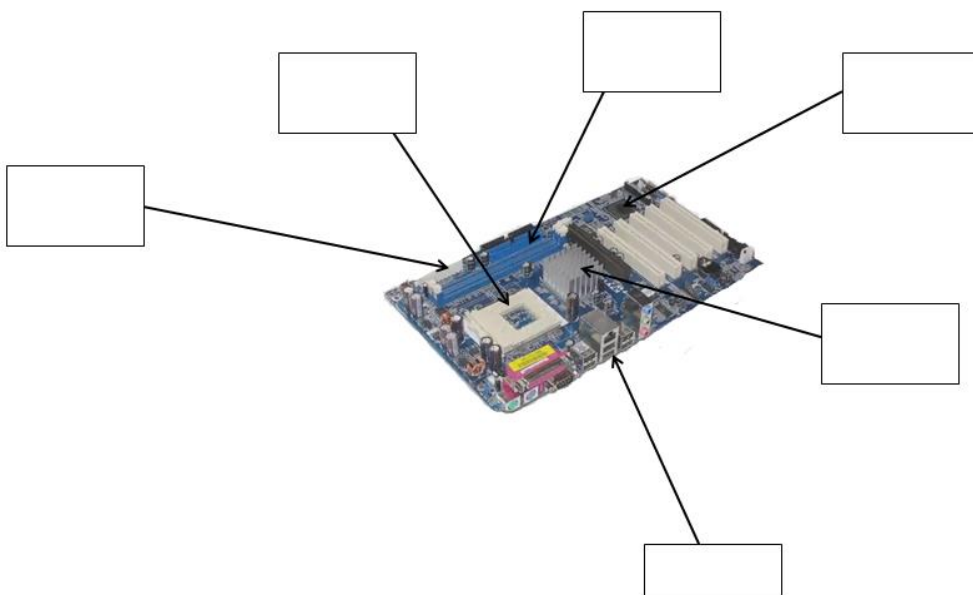
Label the following components of a motherboard.

Exercise 2: Random Access Memory

Research the following types of random access memory chips and document the differences between each type:

Static random access memory (SRAM)
Dynamic Random access memory (DRAM)
Synchronous Dynamic Random Access Memory (SDRAM)
Non-Volatile RAM (NVRAM)
O-DIMM RAM

Exercise 3: Connector cables

Research four types of connector cables and document your findings in a table as shown below:

Connector cable name	Features	Device that it links to

3.7 Tutorial Notes

The time allowance for tutorials in this topic is 2 hours.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

3.7.1 Review of Private Study Exercises

Exercise 1: The motherboard

Label the following components of a motherboard.
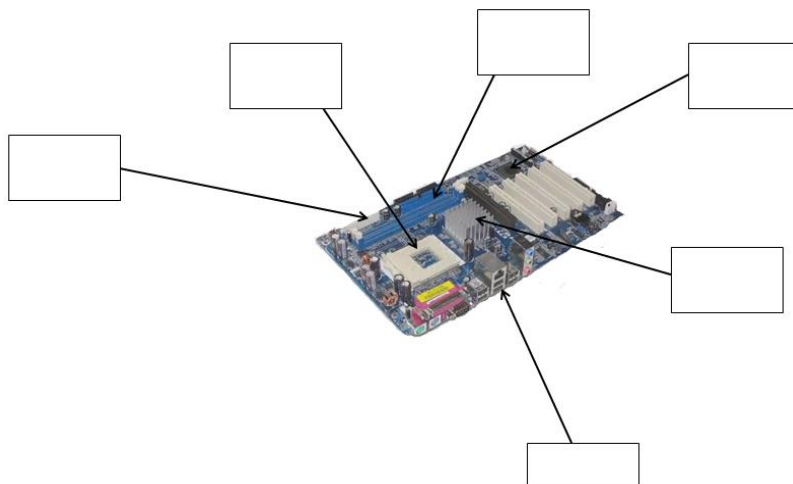
Suggested Answer:
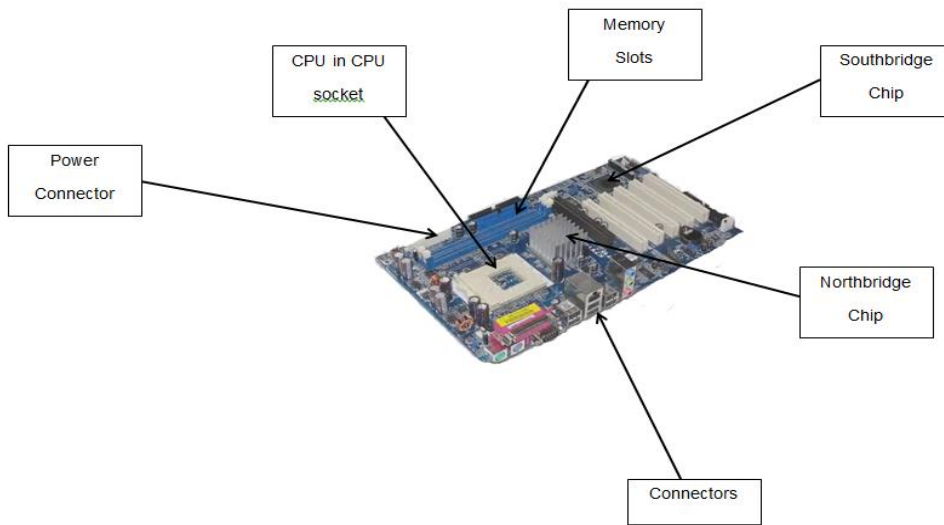
Exercise 2: Random Access Memory

Research the following types of random access memory chips and document the differences between each type:

Static random access memory (SRAM)

Dynamic Random access memory (DRAM)

Synchronous Dynamic Random Access Memory (SDRAM)

Non-Volatile RAM (NVRAM)

SO-DIMM RAM

Suggested Answer:

Static random access memory (SRAM)	Faster, more expensive than DRAM
Dynamic Random access memory (DRAM)	Slower, cheaper than SRAM
Synchronous Dynamic Random Access Memory (SDRAM)	Faster than other RAM
Non-Volatile RAM (NVRAM)	Non-volatile unlike DRAM and SRAM
SO-DIMM RAM	Smaller, used in systems with limited space

Exercise 3: Connector cables

Research four types of connector cables and document your findings in a table as shown below:

Connector cable name	Features	Device that it links to

Suggested Answer:

Research four types of connector cables and document your findings in a table as shown below:

Connector cable name	Features (at least two)	Device that it links to
USB	Physical structure Speed of transfer	Keyboard Mouse Scanner Joystick
Firewire	Physical structure Speed of transfer	Video camera DVD drive
SCSI	Physical structure Speed of transfer	Hard disk drive CD-ROM drive
Parallel	Physical structure Speed of transfer	Printer External hard disk drive

Topic 4: Computer Processors

4.1 Learning Objectives

This topic provides an overview of computer processors.

On completion of the topic, students will be able to:

- Describe the components of a central processing unit (CPU)
- Describe the functions of a CPU
- Explain the function of the fetch-decode-execute cycle

4.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

4.3 Timings

Lectures: 1 hour

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 2 hours

Tutorials: 1 hour

4.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- The role of a computer processor
- Types of processor
- Components of a CPU
- The functions of a CPU
- How components of a CPU communicate with each other
- The fetch-execute-decode cycle

4.4.1 Guidance on the Use of the Slides

Slide 1:   This slide introduces Topic Four.

Slide 2:   This slide states the areas that Topic Four will cover. You can explain that the lecture will focus on the purpose, function and types of computer processor.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lecture and tutorial for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   This slide states the basic features of a computer processor.

Slide 6:   This slide states the names of well-known computer processor manufacturers. You might want to elicit the students' ideas about this before you reveal the names to them

Slide 7:   This slide provides information on the main functions of a computer processor. You might want to ask the students' for their ideas before you reveal each function to them.

Slide 8:   This slide states the main components of a CPU.

Slide 9:   This slide discusses the role of an arithmetic and logic unit.

Slide 10:   This slide discusses the role of a control unit.

Slide 11:   This slide discusses the role of an immediate access store.

Slide 12:   This slide states the performance factors of a processor.

Slide 13:   This slide introduces the two types of processors.

Slide 14:   This slide compares the main differences between CISC and RISC processors.

Slide 15:   This slide reminds the students of clock speed, as discussed in Topic Three (Lecture One, slide 10).

Slide 16:   This slide provides basic information on cores.

Slide 17:   This slide explains the purpose of cache memory and states the three types of cache.

Slide 18:   This slide provides basic information on registers and types of registers.

Slide 19:   This slide explains what is meant by an instruction set.

Slide 20:   This slide explains the role of a bus and acts as a reminder of information in Topic Three (slides 24 and 25). It also describes the connection between the CPU and the cache memory.

Slide 21:   This slide provides information on the address bus and the data bus.

Slide 22:   This slide introduces the process of the fetch, execute and decode cycle.

Slide 23:   This slide explains what occurs in the fetch process.

Slide 24:   This slide explains what occurs in the decode process.

Slide 25:   This slide explains what occurs in the execute process.

Slide 26:   This slide illustrates a diagram that shows the fetch-execute-decode process.

Slide 27:   This slide summarises the main points of the lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 28:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the lecture.

Slide 29:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the tutorial for this topic.

4.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Four

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term.

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

4.6 Private Study

The time allocation for private study in this topic is expected to be 2 hours.

Lecturers' Notes:

Students have copies of the private study exercises in the Student Guide.

Exercise 1: CPU families

Research CPUs from four different manufacturers and record the following features for each one of them:

Type of processor

Clock speed

Cores

Cache size

Cost

Exercise 2: Own device CPU

Research and record information on the features from Exercise 1 for a CPU that is used in a device that you use regularly.

4.7 Tutorial Notes

The time allowance for tutorials in this topic is 1 hour.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

4.7.1 Review of Private Study Exercises

Exercise 1: CPU families

Research CPUs from four different manufacturers and record the following features for each one of them:

Type of processor

Clock speed

Cores

Cache size

Cost

Suggested Answer:

Students could make reference to any four of the microprocessor families, for example, Intel, AMD, DEC, Fujitsu, Hitachi, IBM, Motorola, Sun Microsystems, Zilog

Exercise 2: Own device CPU

Research and record information on the features from Exercise 1 for a CPU that is used in a device that you use regularly.

Suggested Answer:

As above.

Topic 5: Storage Devices and Input and Output Devices

5.1 Learning Objectives

This topic provides an overview of storage devices and input and output devices.

On completion of the topic, students will be able to:

- Identify units of measurements of computer storage
- Describe a range of computer storage media
- Justify the use of a type of storage media for a particular purpose
- Describe a range of input devices
- Justify the use of a type of input device for a particular purpose
- Describe a range of output devices
- Justify the use of an output device for a particular purpose

5.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

5.3 Timings

Lectures: 2 hours

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 4 hours

Tutorials: 2 hours

5.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One
    - Computer storage
    - Units of measurement of computer storage
    - Computer storage media
    - Storage locations
    - Criteria to consider when selecting computer storage
- Lecture Two
    - Input devices
    - Criteria to consider when selecting input devices
    - Output devices
    - Criteria to consider when selecting output devices

5.4.1   Guidance on the Use of the Slides

Lecture One – 1 Hour

Slide 1:   This slide introduces Topic Five. You should inform the students that the topic will be presented in two lectures.

Slide 2:   This slide states the areas that Topic Five will cover. You can explain that Lecture One will focus on storage devices and input and output devices will be covered in Lecture Two.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   This slide continues with stating the learning outcomes for this topic.

Slide 5:   Inform the students that various terminology will be referred to and explained in the lectures and tutorials for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 6:   Inform the students that this is the first slide of Lecture One. This slide is the first slide of two that provides information on units of measurements of data.   You might want to ask the students about this before you reveal each item of information to them.

Slide 7:   This slide continues to discuss units of measurements of data.

Slide 8:   This slide provides information on primary and secondary storage. It introduces the term *non-volatile* and reminds the students of the term *volatile*.

Slide 9:   This slide states information on internal and external storage. You might want to try and elicit the students' ideas before you reveal the types of internal storage devices.

Slide 10:   This slide states examples of magnetic storage media. You might want to ask the students about this before you reveal each example to them.

Slide 11:   This slide introduces hard disk drives and states the two types – internal and external.

Slide 12:   This slide provides information on internal hard disk drives.

Slide 13:   This slide provides information on external hard disk drives.

Slide 14:   This slide provides information on network attached storage.

Slide 15:   This slide provides information on magnetic tape.

Slide 16:   This slide illustrates the main characteristics of magnetic storage media. You might want to ask the students their ideas about this before you reveal the details of each characteristic to them.

Slide 17:   This slide states examples of optical storage media. You might want to ask the students their ideas about this before you reveal the examples to them.

Slide 18:   This slide provides basic information on CD storage media.

Slide 19:   This slide provides a definition of *CD-ROM*.

Slide 20:   This slide provides information on two types of recordable CDs. You might want to ask the students their ideas about this before you reveal each type.

Slide 21:   This slide provides basic information on DVD storage media.

Slide 22:   This slide provides information on two types of recordable DVDs. You might want to ask the students their ideas about this before you reveal each type

Slide 23:   This slide provides information on Blu-ray disks and three types of Blu-ray storage media.

Slide 24:   This slide illustrates the main characteristics of optical storage media. You might want to ask the students their ideas about this before you reveal the details of each characteristic to them.

Slide 25:   This slide provides three examples of solid state storage media. You might want to ask the students their ideas about this before you reveal the examples to them.

Slide 26:   This slide provides information on solid state storage media.

Slide 27:   This slide provides information on USB memory sticks.

Slide 28:   This slide provides information on memory cards/SD cards. You might want to ask the students to provide examples of devices that use this type of storage before you reveal the examples to them.

Slide 29:   This slide illustrates the main characteristics of solid state storage media. You might want to ask the students their ideas about this before you reveal the details of each characteristic to them.

Slide 30:   This slide states criteria that should be applied when choosing storage devices. It is suggested that you inform the students that they will be given opportunities to apply these criteria when they research, select and justify what storage devices should be used for particular users.

Slide 31:   This slide summarises the main points of the first lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of subject content in the reading recommended on the next slide.

Slide 32:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the first lecture.

Lecture Two – 1 Hour

Slide 33:   This slide is the first slide of **Lecture Two** and introduces input and output devices.

Slide 34:   This slide provides basic information on the purpose of input devices.

Slide 35:   This slide states examples of input devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 36:   This slide states examples of key and button input devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 37:   This slide states examples of pointing input devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 38:   This slide states examples of visual digital input devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 39:   This slide states examples of speech and audio input devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 40:   This slide states examples of head and eye input devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 41:   This slide displays a range of input devices. You can point to each device and elicit if the students can identify each type.

Slide 42: This slide explains the criteria that should be considered when selecting an input device. It is suggested that you inform the students that they will be given opportunities to apply these criteria when they research, select and justify what input devices should be used for particular users. You might want to try and elicit the students' ideas before you reveal each criterion to them.

Slide 43: This slide introduces categories of output devices.

Slide 44: This slide states examples of visual output devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 45: This slide states examples of audio output devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 46: This slide states examples of tactile output devices. You might want to ask the students to provide examples before you reveal the examples to them.

Slide 47: This slide displays a range of output devices. You can point to each device and elicit if the students can identify each type.

Slide 48: This slide states criteria that should be applied when choosing output devices. It is suggested that you inform the students that they will be given opportunities to apply these criteria when they research, select and justify what output devices should be used for particular users.

Slide 49: This slide summarises the main points of the second lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of subject content in the reading recommended on the next slide.

Slide 50: This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the second lecture.

Slide 51: This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the two tutorials for this topic.

5.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Five

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

5.6 Private Study

The time allocation for private study in this topic is expected to be 4 hours.

Lecturers' Notes:

Students have copies of the private study exercises in the Student Guide.

Exercise 1: Advantages and disadvantages of four types of storage device

Research and document the advantages and disadvantages of four types of storage device.

Exercise 2: Robotic arms

Robotic arms are used in a number of application areas. Undertake research to find five facts about this type of input device.

Exercise 3: Input devices

Undertake research and find three facts about each of the following types of input device:

Membrane keyboard
Wireless keyboard
Biometric reader

Exercise 4: Output Devices

Document the specification of an output device that you use regularly.

5.7 Tutorial Notes

The time allowance for tutorials in this topic is 2 hours.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

5.7.1   Review of Private Study Exercises

Exercise 1: Advantages and disadvantages of four types of storage device

Research and document the advantages and disadvantages of four types of storage device.

Suggested Answer:

Any four types of storage device can be chosen.
Reference should be made to criteria such as:

Storage capacity
Cost
Reliability
Portability
Durability

Exercise 2: Robotic arms

Robotic arms are used in a number of application areas. Undertake research to find five facts about this type of input device.

Suggested Answer:

Reference could be made to:

Application areas where robotic arms can be found, for example, medicine, industry
Precision tasks can be performed
Have replaced people in some jobs
Can be used for educational purposes
Can be used as assistive devices

Exercise 3: Input Devices

Undertake research and find three facts about each of the following types of input device:

Membrane keyboard
Wireless keyboard
Biometric reader

Suggested Answer:

Reference could be made to:

Application areas
 Users
Cost
Reliability
Durability

Exercise 4: Output Devices

Document the specification of an output device that you use regularly.

Suggested Answer:

Reference can be made to a number of different devices. A detailed spec should be provided.

Topic 6: Data Representation

6.1 Learning Objectives

This topic provides an overview of data representation.

On completion of the topic, students will be able to:

- Describe how data is represented by binary
- Describe how data is represented by ASCII
- Describe how data is represented by hexadecimal
- Explain how data is represented by Unicode
- Explain what is meant by encryption
- Identify examples of encryption
- Explain the purpose of data compression

6.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

6.3 Timings

Lectures: 1 hour

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 2 hours

Tutorials: 1 hour

6.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Binary representation of data
- ASCII representation of data
- Unicode representation of data
- Definitions of encryption and decryption
- Examples of encryption
- Definition of compression
- Compression of data

6.4.1 Guidance on the Use of the Slides

Slide 1:   This slide introduces Topic Six.

Slide 2:   This slide states the areas that Topic Six will cover. You can explain that the lecture will focus on methods of representation of data in a computer system.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lecture and tutorial for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   This slide states the different ways that data can be represented in a computer system.

Slide 6:   This slide describes how binary can be used to represent data in a computer system.

Slide 7:   This slide continues from slide 6.

Slide 8:   This slide describes how hexadecimal can be used to represent data in a computer system.

Slide 9:   This slide displays a table that illustrates each hexadecimal digit and its equivalent values in binary and denary

Slide 10:   This slide provides examples of hexadecimal representation of data.

Slide 11:   This slide explains other examples of how hexadecimal is used.

Slide 12:   This slide describes how hexadecimal can be used to represent colour.

Slide 13:   This slide illustrates colours and their corresponding hexadecimal codes.

Slide 14:   This slide displays examples of decimal numbers represented in binary.

Slide 15:   This slide describes ASCII representation of data.

Slide 16:   This slide displays standard ASCII codes.

Slide 17:   This slide displays extended ASCII character codes.

Slide 18:   This slide describes Unicode representation of data.

Slide 19:   This slide displays representation of Chinese characters.

Slide 20:   This slide displays representation of Arabic characters.

Slide 21:   This slide displays representation for Indian languages.

Slide 22:   This slide displays representation of Russian Cyrillic characters.

Slide 23:   This slide describes encryption and decryption. You might ask the students if they are familiar with these terms and if so, to explain in their own words what each means.

Slide 24:   This slide describes uses of encryption. You might ask the students for their suggestions before you reveal each point.

Slide 25:   This slide illustrates an example of an encrypted email.

Slide 26:   This slide introduces data compression. You might ask the students if they are familiar with this term and if so, to explain in their own words what it means.

Slide 27:   This slide describes file compression.

Slide 28:   This slide describes media compression.

Slide 29:   This slide summarises the main points of the lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 30:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the lecture.

Slide 31:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the tutorial for this topic.

6.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Six

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

6.6 Private Study

The time allocation for private study in this topic is expected to be 2 hours.

Lecturers' Notes:
Students have copies of the private study exercises in the Student Guide.

Exercise 1: Encryption

Describe the advantages and disadvantages of encryption.

Exercise 2: Caesar Cipher

Research the Caeser Cipher and write a brief encrypted note to be read and decrypted by your class mates in the tutorial.

6.7 Tutorial Notes

The time allowance for tutorials in this topic is 1 hour.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

6.7.1   Review of Private Study Exercises

Exercise 1: Encryption

Describe the advantages and disadvantages of encryption.

Suggested Answer:

Secure data is the main advantage
If you forget the password, you may never recover the encrypted data
Passwords may be easy to guess
Can be put to bad use
Other people might not want to decrypt files

Exercise 2: Caesar Cipher

Research the Caesar Cipher and write a brief encrypted note to be read and decrypted by your class mates in the tutorial.

Suggested Answer:

This should lead to an interesting and enjoyable session with the students gaining more of an insight into encryption.

Topic 7: Number Representation

7.1 Learning Objectives

This topic provides an overview of number representation.

On completion of the topic, students will be able to:

- Explain the purpose of number systems

- Explain the binary number system

- Demonstrate addition or subtraction of binary numbers

- Demonstrate an understanding of two's complement

- Explain the hexadecimal number system

- Demonstrate conversion between decimal, binary or hexadecimal numbers

7.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

7.3 Timings

Lectures:	2 hours
Seminars:	0 hours
Laboratory Sessions:	1 hour
Private Study:	4 hours
Tutorials:	2 hours

7.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One
    - Number systems
    - Decimal number system
    - Binary number system
    - Why consider number systems?
    - Addition of binary numbers
    - Subtraction of binary numbers
    - Two's complement
- Lecture Two
    - Hexadecimal number system
    - Converting decimal, binary and hexadecimal numbers

7.4.1 Guidance on the Use of the Slides

Lecture One – 1 Hour

Slide 1:   This slide introduces Topic Seven.

Slide 2:   This slide states the areas that Topic Seven will cover. You can explain that there will be two lectures, the first lecture will focus on binary number systems and the second lecture will focus on hexadecimal number systems and conversion between number systems.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lectures and tutorials for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   This slide introduces number systems.

Slide 6:   This slide displays a table that illustrates numbers and alphabetic characters used in binary, decimal and hexadecimal number systems.

Slide 7:   This slide introduces the binary number system.

Slide 8:   This slide demonstrates a method of adding two binary numbers. You could provide another example and ask the students if they can complete it and then work through the calculation together.

Slide 9:   This slide demonstrates a method of subtracting binary numbers. You could provide another example and ask the students if they can complete it and then work through the calculation together.

Slide 10:   This slide provides a basic example of two's complement. You could provide another example and ask the students if they can complete it and then work through the calculation together.

Slide 11:   This slide summarises the main points of the lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 12:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the lecture.

Lecture Two – 1 hours

Slide 13:   This slide is the first slide of **Lecture Two** and introduces the hexadecimal number system.

Slide 14:   This slide introduces describes the purpose of number conversions.

Slide 15:   This slide demonstrates how to convert decimal numbers into binary numbers.

Slide 16:   This slide demonstrates how to convert binary numbers into decimal numbers.

Slide 17:   This slide demonstrates how to convert decimal numbers into hexadecimal numbers.

Slide 18:   This slide demonstrates how to convert hexadecimal numbers into decimal numbers.

Slide 19:   This slide demonstrates how to convert binary numbers into hexadecimal numbers.

Slide 20:   This slide summarises the main points of lecture two. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 21:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the lecture.

Slide 22:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the tutorial for this topic.

7.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Seven

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

7.6 Private Study

The time allocation for private study in this topic is expected to be 4 hours.

Lecturers' Notes:
Students have copies of the private study exercises in the Student Guide.

Exercise 1: Student guide to Binary

Create a student guide to binary. You must include information on addition and subtraction of binary and demonstrate clearly how addition and subtraction can be undertaken in binary. Your guide should be easy to understand.

Exercise 2: Student guide to Hexadecimal

Create a student guide to hexadecimal. You should show how hexadecimal can be used to represent colours. Your guide should be easy to understand.

Exercise 3: Student guide on Number Conversions

Create a student guide on conversions between decimal, binary and hexadecimal number systems. Your guide should be easy to understand.

7.7 Tutorial Notes

The time allowance for tutorials in this topic is 2 hours.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

7.7.1 Review of Private Study Exercises

Exercise 1: Student guide to Binary

Create a student guide to binary. You must include information on addition and subtraction of binary and demonstrate clearly how addition and subtraction can be undertaken in binary. Your guide should be easy to understand.

Exercise 2: Student guide to Hexadecimal

Create a student guide to hexadecimal. You should show how hexadecimal can be used to represent colours. Your guide should be easy to understand.

Exercise 3: Student guide on Number Conversions

Create a student guide on conversions between decimal, binary and hexadecimal number systems. Your guide should be easy to understand.

Suggested Answer:

The rationale behind these exercises is that they will provide the students with the opportunity to work on conversions, etc. and think carefully about the topic. Taking ownership of the subject matter, it is hoped, will encourage them to gain more knowledge and understanding by practice and having to explain to others.

Topic 8: Image and Sound Representation

8.1 Learning Objectives

This topic provides an overview of how image and sound are represented in a computer system.

On completion of the topic, students will be able to:

- Describe how images are represented in a computer system

- Describe how sound is represented in a computer system

- Explain how compression can facilitate storage and transmission of images or sound

8.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

8.3 Timings

Lectures: 2 hours

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 4 hours

Tutorials: 2 hours

8.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One:
  - o Image representation
  - o Image file formats
  - o Compression of images
- Lecture Two
  - o Sound representation
  - o Sound file formats
  - o Compression of sound

8.4.1 Guidance on the Use of the Slides

Lecture One - 1 hour

Slide 1:   This slide introduces Topic Eight.

Slide 2:   This slide states the areas that Topic Eight will cover. You can explain that there will be two lectures, the first lecture will focus on image representation in a computer system and how compression can aid storage and transmission of images. The second lecture will focus on sound representation in a computer system and how compression can aid storage and transmission of sound.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lectures and tutorials for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   This slide provides an introduction to image representation.

Slide 6:   This slide describes features of bitmap/raster images.

Slide 7:   This slide displays a bitmap image and an enlarged bitmap image.

Slide 8:   This slide displays bitmap/raster file formats.

Slide 9:   This slide describes features of vector images.

Slide 10:   This slide displays a vector image.

Slide 11:   This slide displays a table of vector file formats.

Slide 12:   This slide describes the purpose of compression.

Slide 13:   This slide introduces lossy and lossless image compression.

Slide 14:   This slide describes lossy image compression.

Slide 15:   This slide describes lossless image compression.

Slide 16:   This slide provides examples of types of compressed image file formats.

Slide 17:   This slide summarises the main points of the lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 18:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the lecture.

Lecture Two - 1 hour

Slide 19:   This slide is the first slide of **Lecture Two** and introduces sound representation in a computer system.

Slide 20:   This slide provides an explanation of digital sound quality.

Slide 21:   This slide describes sound file formats.

Slide 22:   This slide displays a table that illustrates sound file formats and extensions. You might want to ask the students for their ideas before you reveal the examples and discuss further.

Slide 23:   This slide describes the need for compression of sound files.

Slide 24:   This slide describes lossy audio compression.

Slide 25:   This slide describes lossless audio compression.

Slide 26:   This slide summarises the main points of Lecture Two. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 27:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the lecture.

Slide 28:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the tutorial for this topic.

8.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Eight

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

8.6 Private Study

The time allocation for private study in this topic is expected to be 4 hours.

Lecturers' Notes: Students have copies of the private study exercises in the Student Guide.

Exercise 1: Image File Formats

Find three features of each of the following and explain the differences between them.

JPEG
PNG
GIF

Exercise 2: Bitmap Graphic Editors

Research a bitmap graphic editor. Use it and document at least ten features.

Exercise 3: Vector Graphic Editors

Research a vector graphic editor. Use it and document at least ten features.

Exercise 4: Bitmap vs Vector Graphic Editors

Having used both a bitmap and a vector graphic editor, state which one you preferred to use and explain the reasons for your choice.

8.7 Tutorial Notes

The time allowance for tutorials in this topic is 2 hours.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

8.7.1   Review of Private Study Exercises

Exercise 1: Image File Formats

Find three features on each of the following and explain the differences between them.

JPEG
PNG
GIF

Exercise 2: Bitmap Graphic Editors

Research a bitmap graphic editor. Use it and document at least ten features.

Exercise 3: Vector Graphic Editors

Research a bitmap graphic editor. Use it and document at least ten features.

Exercise 4: Bitmap vs Vector Graphic Editors

Having used both a bitmap and a vector graphic editor, state which one you preferred to use and explain the reasons for your choice.

Suggested Answer:

Ask candidates to explain and justify their answers.

Topic 9: Digital Logic

9.1 Learning Objectives

This topic provides an overview of digital logic.

On completion of the topic, students will be able to:

- Define the term 'digital logic'
- Explain the purpose and operation of logic gates

9.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

9.3 Timings

Lectures: 1 hour

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 2 hours

Tutorials: 1 hour

9.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Digital logic
- Truth tables
- Logic gates
  - AND
  - OR
  - NOT
  - NAND
  - NOR

9.4.1 Guidance on the Use of the Slides

Slide 1:   This slide introduces Topic Nine.

Slide 2:   This slide states the areas that Topic Nine will cover. You can explain that the lecture will focus on digital logic and the purpose and operation of logic gates.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lecture and tutorial for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   This slide describes what is meant by the term *digital logic*.

Slide 6:   This slide describes what is meant by a logic gate.

Slide 7:   This slide states types of logic gates.

Slide 8:   This slide describes a truth table and displays an example.

Slide 9:   This slide describes an example of an AND gate, displays an AND symbol and a truth table for an AND gate.

Slide 10:   This slide describes an example of an OR gate, displays an OR symbol and a truth table for an OR gate.

Slide 11:   This slide describes an example of a NOT gate, displays a NOT symbol and a truth table for an NOT gate.

Slide 12:   This slide describes an example of a NAND gate, displays a NAND symbol and a truth table for a NAND gate.

Slide 13:   This slide describes an example of a NOR gate, displays a NOR symbol and a truth table for a NOR gate.

Slide 14:   This slide displays a truth table that illustrates the logical functions of two-input logic gates.

Slide 15:   This slide displays an example of a complex logic gate and its associated truth table. You should ask the students to identify each gate and the input and output associated with each gate.

Slide 16:   This slide summarises the main points of the lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 17:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the lecture.

Slide 18:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the tutorial for this topic.

9.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Nine

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

9.6 Private Study

The time allocation for private study in this topic is expected to be 2 hours.

Lecturers' Notes:
Students have copies of the private study exercises in the Student Guide.

Exercise 1: Match truth tables to logic gates

Draw a logic gate for each of the following truth tables

a)

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

b)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

c)

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

d)

A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

e)

A	C
0	1
1	0

9.7 Tutorial Notes

The time allowance for tutorials in this topic is 1 hour.

Lecturers' Notes:
Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

9.7.1 Review of Private Study Exercises

Exercise 1: Match truth tables to logic gates

Draw a logic gate for each of the following truth tables

a)

A		B
0		0
0		1
1		0
1		1

b)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

c)

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

d)

A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

e)

A	C
0	1
1	0

Suggested Answer:

a) NAND

b) NOR
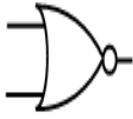
c) AND

d) OR
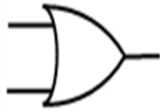
e) NOT
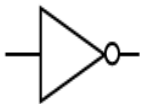
Topic 10: Computer Networks

10.1 Learning Objectives

This topic provides an overview of computer networks.

On completion of the topic, students will be able to:

- Explain the purpose of a computer network
- Describe types of computer network or explain the criteria for selecting a particular type of network
- Describe the hardware used in a computer network
- Describe the software used in a computer network
- Describe the transmission media used in a computer network
- Describe types of network transmission protocols

10.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

10.3 Timings

Lectures: 2 hours

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 4 hours

Tutorials: 2 hours

10.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One
    - Definition of a computer network
    - Types of network
    - Criteria for selecting a network
    - Network hardware
- Lecture Two
    - Network transmission media
    - Network transmission protocols
    - Network software

10.4.1 Guidance on the Use of the Slides

Lecture One - 1 hour

Slide 1:   This slide introduces Topic Ten. You should inform the students that the topic will be presented in two lectures.

Slide 2:   This slide states the areas that Topic Ten will cover. You can explain that Lecture One will focus on the purposes and types of computer networks and the hardware and software that they use. Network transmission media and network protocols will be covered in Lecture Two.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lectures and tutorials for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   Inform the students that this is the first slide of **Lecture One**. This slide provides a definition of the term *computer network* and describes features of computer networks. You might want to try and elicit the students' ideas about this before you reveal the definition and descriptions to them.

Slide 6:   This slide states various uses of computer networks. You might want to ask the students if they can provide examples of uses before you reveal the listed uses.

Slide 7:   This slide states the two main types of computer network.

Slide 8:   This slide describes features of a client-server network.

Slide 9:   This slide describes features of a peer-to-peer network.

Slide 10:   This slide lists examples of categories of network. You might want to ask the students if they can provide examples before you reveal the list.

Slide 11:   This slide describes features of local area networks.

Slide 12:   This slide describes features of wide area networks.

Slide 13:   This slide describes features of metropolitan area networks.

Slide 14:   This slide describes features of personal area networks.

Slide 15:   This slide describes features of wireless personal area networks.

Slide 16:   This slide describes features of virtual private networks.

Slide 17:   This slide describes features of a satellite network.

Slide 18:   This slide states the criteria that should be considered when selecting a network. You might want to try and elicit the students' ideas about this before you reveal each criterion to them.

Slide 19:   This slide states the main types of hardware that is required for a computer network. You might want to ask the students if they can provide examples before you reveal the examples to them.

Slide 20:   This slide states the main types of servers that are required for a computer network. You might want to ask the students if they can provide examples before you reveal the examples to them.

Slide 21:   This slide states the main types of cables that are required for a computer network. You might want to ask the students if they can provide examples before you reveal the examples to them.

Slide 22:   This slide states the main types of routers that are required for a computer network. You might want to ask the students if they can provide examples before you reveal the examples to them.

Slide 23:   This slide provides a definition for a switch as used on a network.

Slide 24:   This slide describes features of a repeater.

Slide 25:   This slide describes features of a bridge.

Slide 26:   This slide describes features of a gateway.

Slide 27:   This slide describes features of a network interface card.

Slide 28:   This slide describes features of a media access control address.

Slide 29:   This slide summarises the main points of the first lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 30:   This slide recommends references/websites that the students can access for further information on the subject content discussed in the first lecture. You can inform students that this is the last slide of Lecture One.

Lecture Two - 1 hour

Slide 31:   This slide is the first slide of **Lecture Two**. It states the three types of LAN transmission modes.

Slide 32:   This slide states examples of network transmission media. You might want to ask the students if they can provide examples before you reveal each of the examples to them.

Slide 33:   This slide describes features of the Ethernet protocol.

Slide 34:   This slide describes features of wireless networks.

Slide 35:   This slide describes features of voice over Internet networks.

Slide 36:   This slide lists the two main types of network transmission protocols.

Slide 37:   This slide describes the layers of the Transmission Control Protocol (TCP/IP)

Slide 38:   This slide describes the layers of the OSI Reference Model

Slide 39:   This slide states examples of essential software used in computer networks. You might want to ask the students if they can provide examples before you reveal the examples to them.

Slide 40:   This slide summarises the main points of the second lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of subject content in the reading recommended on the next slide.

Slide 41:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the second lecture.

Slide 42:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the two tutorials for this topic.

10.5 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Ten

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

10.6 Private Study

The time allocation for private study in this topic is expected to be 4 hours.

Lecturers' Notes:

Students have copies of the private study exercises in the Student Guide.

Exercise 1: Specification for a new local area network

You have been asked by a manager of a small department in a large marketing company to set up a local area network of six computers and devices.

Provide a specification of the hardware and software that you will need to use.

Exercise 2: Wireless Networks

Research the advantages and disadvantages of using wireless networks and document your information.

Exercise 3: Network security software

Recommend three types of security software that should be used by the department referred to in Exercise 1. For each type of software, provide four reasons why you recommend it is used.

10.7 Tutorial Notes

The time allowance for tutorials in this topic is 2 hours.

Lecturers' Notes:
Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.
Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

10.8 Review of Private Study Exercises

Exercise 1: Specification for a new local area network

You have been asked by a manager of a small department in a large marketing company to set up a local area network of six computers and devices.

Provide a specification of the hardware and software that you will need to use.

Suggested Answer:

Hardware should make reference to type of:

- Computer

- Server

- Cable/wireless technology

- Connector

- Router/switch

Software should make reference to type of:

- Operating system software

- Utility software

- Application software

- Security software, e.g. firewall, anti-malware, intrusion prevention, intrusion detection

Exercise 2: Wireless Networks

Research the advantages and disadvantages of using wireless networks and document your information.

Suggested Answer:

Advantages	Disadvantages
Cheaper to install than wired	Can be less secure
Efficient due to mobility, can use while on the move	Coverage is not always good
	Transmission speeds can be slow

Exercise 3: Network security software

Recommend three types of security software that should be used by the department referred to in Exercise 1. For each type of software, provide four reasons why you recommend it is used.

Suggested Answer:

Students could make reference to:

Firewalls
Anti-malware
Anti-virus
Anti-spyware
Intruder detection
Intruder prevention

And explain the benefits of each of their choices.

Topic 11: Network Topologies and the Internet

11.1   Learning Objectives

This topic provides an overview of network topologies and the Internet.

On completion of the topic, students will be able to:

- Describe types of computer network topology or justify the use of a topology for a particular purpose
- Describe Internet and World Wide Web technologies
- Discuss issues that affect computer networks

11.2   Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

11.3   Timings

Lectures: 2 hours

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 4 hours

Tutorials: 2 hours

11.4   Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One
    - Define a network topology
    - Types of topology
    - Criteria for selecting a topology
- Lecture Two
    - Definition of the Internet
    - Definition of the World Wide Web (WWW)
    - World Wide Web technologies
    - Computer network issues

11.4.1 Guidance on the Use of the Slides

Lecture One - 1 hour

Slide 1:   This slide introduces Topic Eleven. You should inform the students that the topic will be presented in two lectures.

Slide 2:   This slide states the areas that Topic Eleven will cover. You can explain that Lecture One will focus on the purposes and types of computer network topologies and the criteria for selecting topologies. Features of the Internet, World Wide Web, Web technologies and issues associated with computer networks will be discussed in Lecture Two.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lectures and tutorials for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   Inform the students that this is the first slide of **Lecture One**. This slide provides a definition of a computer network topology.

Slide 6:   This slide lists types of computer network topologies. You might want to ask the students if they can provide any examples before you reveal the examples to them.

Slide 7:   This slide describes features of a bus topology.

Slide 8:   This slide describes the advantages and disadvantages of a bus topology. You might want to ask the students their ideas on this before you reveal the advantages and disadvantages to them.

Slide 9:   This slide describes features of a ring topology.

Slide 10:   This slide describes the advantages and disadvantages of a ring topology. You might want to ask the students their ideas on this before you reveal the advantages and disadvantages to them.

Slide 11:   This slide describes features of a star topology.

Slide 12:   This slide describes the advantages and disadvantages of a star topology. You might want to ask the students their ideas on this before you reveal the advantages and disadvantages to them.

Slide 13:   This slide describes features of a mesh topology.

Slide 14:   This slide describes the advantages and disadvantages of a mesh topology. You might want to ask the students their ideas on this before you reveal the advantages and disadvantages to them.

Slide 15:   This slide describes the features of a tree topology.

Slide 16:   This slide describes the advantages and disadvantages of a tree topology. You might want to ask the students their ideas on this before you reveal the advantages and disadvantages to them.

Slide 17:   This slide describes the features of a hybrid topology.

Slide 18:   This slide describes the advantages and disadvantages of a hybrid topology. You might want to ask the students their ideas on this before you reveal the advantages and disadvantages to them.

Slide 19:   This slide states the criteria that should be considered when selecting a topology. You might want to try and elicit the students' ideas about this before you reveal each criterion to them.

Slide 20:   This slide summarises the main points of the first lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 21:   This slide recommends references/websites that the students can access for further information on the subject content discussed in the first lecture. You can inform students that this is the last slide of Lecture One.

Lecture Two - 1 hour

Slide 22:   This slide is the first slide of **Lecture Two**. It describes features of the Internet. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 23:   This slide states examples of services provided by the Internet. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 24:   This slide describes features of the Internet of Things. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 25:   This slide describes features of an intranet. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 26:   This slide describes features of an extranet. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 27:   This slide states the main connections required for access to the Internet. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 28:   This slide states the main connections required for Broadband access to the Internet. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 29:   This slide states the main connections for required for ASDL access to the Internet. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 30:   This slide states the main connections for required for 3G and 4G access to the Internet. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 31:   This slide states features of Internet protocols.

Slide 32:   This slide describes examples of the Transmission Control Protocol/Internet Protocol (TCP/IP).

Slide 33:   This slide provides a definition of the World Wide Web. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 34:   This slide describes features of the Web. You might want to ask the students for their ideas before you reveal the features on the slide.

Slide 35:   This slide states a number of Web technologies. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 36:   This slide states the purpose of hypertext mark-up language. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 37:   This slide states the purpose of JavaScript. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 38:   This slide states the purpose of cascading style sheets. You might want to ask the students for their ideas before you reveal the points on the slide.

Slide 39:   This slide states the purpose of hypertext transfer protocol.

Slide 40:   This slide states the purpose of a Web browser and provides examples of popular browsers. You might want to ask the students for their ideas before you reveal the examples on the slide.

Slide 41:   This slide describes the purpose of Web servers and server racks and states examples of web hosting companies. You might want to ask the students for their ideas before you reveal the examples on the slide.

Slide 42:   This slide states some of the issues that are associated with computer networks. You might want to ask the students for their ideas before you reveal the examples on the slide.

Slide 43:   This slide summarises the main points of the second lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of subject content in the reading recommended on the next slide.

Slide 44:   This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the second lecture.

Slide 45:   This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the two tutorials for this topic.

11.5   Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Eleven

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

11.6   Private Study

The time allocation for private study in this topic is expected to be 4 hours.

Lecturers' Notes:
Students have copies of the private study exercises in the Student Guide.

Exercise 1:   Mobile websites and Apps

Describe at least six differences between a mobile website and an App.

Exercise 2: The Internet Society

Research the Internet Society and document five items of information about this organisation.

Exercise 3: Browser comparison

Compare four different web browsers and document your information in a table as follows:

Browser	Ease of Use/Support	Speed	Security

Exercise 4: Network Issues

Security is a major concern when using the Internet. Identify three security threats to Internet users and for each of these threats, describe a security measures that can be taken to try and avoid the threat.

11.7   Tutorial Notes

The time allowance for tutorials in this topic is 2 hours.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

11.7.1 Review of Private Study Exercises

Exercise 1:   Mobile websites and Apps

Describe at least six differences between a mobile website and an App.

Suggested Answer:

Students could make reference to:

Apps are easy to use
Apps are fast
Apps can track location
Apps can record key clicks
Apps can upload data to the cloud for analysis
Some Apps don't work properly, poor quality
Mobile websites are searchable
There are responsive websites that adjust to a mobile's display
Mobile websites are easier to develop and update
Separate versions of websites aren't required for different devices
Mobile websites aren't as efficient in tracking as Apps

Exercise 2: The Internet Society

Research the Internet Society and document five items of information about this organisation.

Suggested Answer:

Any 5 appropriate pieces of information.

Exercise 3: Browser comparison

Compare four different web browsers and document your information in a table as follows:

Browser	Compatibility	Ease of Use/Support	Speed	Security

Suggested Answer:

Browser	Compatibility	Ease of Use/Support	Speed	Security
Firefox	Windows Mac OS Linux	Can be customized easily Offers tour, help, troubleshooting	Can be slow	Blocks third-party trackers User can select security options

Browsers can include: Google Chrome, Internet Explorer (IE), Safari, Opera, Vivaldi, Edge, Maxthon Cloud, Waterfox

Exercise 4: Network Issues

Security is a major concern when using the Internet. Identify three security threats to Internet users and for each of these threats, describe a security measures that can be taken to try and avoid the threat.

Suggested Answer:

References could be made to the following threats: Hacking Malware Phishing Etc.	References could be made to the following security measures: Anti-malware Encryption Security awareness training Firewalls Intruder detection Intruder prevention Etc.

Topic 12: Cultural, Ethical and Legal Issues Relating to Computing

12.1 Learning Objectives

This topic provides an overview of cultural, ethical and legal issues that relate to computing.

On completion of the topic, students will be able to:

- Explain what a cultural issue is
- Describe a range of cultural issues
- Explain how cultural issues can be addressed
- Explain what an ethical issue is
- Describe a range of ethical issues
- Explain how ethical issues can be addressed
- Identify laws and guidelines that relate to computing
- Describe situations where laws and guidelines have been used to deal with people using computers to commit crimes or cause offence

12.2 Pedagogic Approach

Information will be transmitted to the students during the lectures. They will then practise the skills during the tutorial and seminar sessions.

12.3 Timings

Lectures: 3 hours

Seminars: 0 hours

Laboratory Sessions: 1 hour

Private Study: 6 hours

Tutorials: 3 hours

12.4 Lecture Notes

The following is an outline of the material to be covered during the lecture time. Please also refer to the slides.

The structure of this topic is as follows:

- Lecture One
  - Definition of cultural issues
  - Examples of cultural issues
  - Addressing cultural issues
- Lecture Two
  - Definition of ethical issues
  - Examples of ethical issues
  - Addressing ethical issues
- Lecture Three
  - UK laws and guidelines
  - Data Protection Act (1998)
  - Computer Misuse Act (1990)
  - Copyright, Designs and Patents Act (1988)
  - Global laws and computers
  - Examples of situations where the law has been applied

12.5 Guidance on the Use of the Slides

Lecture One – 1 hour

Slide 1:   This slide introduces Topic Twelve. You should inform the students that the topic will be presented in three lectures.

Slide 2:   This slide states the areas that Topic Twelve will cover. You can explain that Lecture One will focus on cultural issues and computing. Lecture Two will focus on ethical issues and computing and Lecture Three will focus on laws and guidelines and computing.

Slide 3:   This slide states the learning outcomes for this topic.

Slide 4:   Inform the students that various terminology will be referred to and explained in the lectures and tutorials for this topic. Request that students use these sessions to ask questions and ask them to write down accurate examples that other students might suggest.

Slide 5:   Inform the students that this is the first slide of **Lecture One**. This slide provides a broad definition of the term *culture*. You might ask the students to offer their ideas before you reveal the examples on the slide.

Slide 6:   This slide provides a continuation of the examples introduced on slide five.

Slide 7:   This slide states a number of examples of cultural issues. You might ask the students to offer their ideas before you reveal the examples on the slide.

Slide 8:   This slide asks the students to consider three questions. Ask the students to write down their thoughts for each of these questions and inform them that you will discuss their ideas in the tutorial for the topic.

Slide 9:   This slide describes examples of culture and computing.

Slide 10:   This slide states a number of examples of culture and computing. You might ask the students to offer their ideas before you reveal the examples on the slide.

Slide 11:   This slide makes reference to culture and cybercrime and explains that this will be discussed further in Lecture Three of this topic.

Slide 12:   This slide states a number of examples of culture and work. You might ask the students to offer their ideas before you reveal the examples on the slide.

Slide 13:   This slide asks the students to consider two questions. Ask the students to write down their thoughts for each of these questions and inform them that you will discuss their ideas in the tutorial for the topic.

Slide 14:   This slide provides suggestions on how cultural issues and computing can be addressed.

Slide 15:   This slide summarises the main points of the first lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 16:   This slide recommends references/websites that the students can access for further information on the subject content discussed in the first lecture. You can inform students that this is the last slide of Lecture One.

Lecture Two – 1 hour

Slide 17:   This slide is the first slide of **Lecture Two**. It provides a definition of an ethical issue.

Slide 18:   This slide states a number of examples of ethical issues. You might ask the students to offer their ideas before you reveal the examples on the slide.

Slide 19:   This slide states a number of examples of ethical issues in computing. You might ask the students to offer their ideas before you reveal the examples on the slide.

Slide 20:   This slide describes what is meant by the *Digital Divide*. You might ask the students to offer their ideas before you reveal the points on the slide.

Slide 21:   This slide describes what is meant by the *Global Divide*. You might ask the students to offer their ideas before you reveal the points on the slide.

Slide 22:   This slide describes some environmental advantages of computing. You might ask the students to offer their ideas before you reveal the points on the slide.

Slide 23:   This slide describes some environmental disadvantages of computing. You might ask the students to offer their ideas before you reveal the points on the slide.

Slide 24:   This slide provides further examples of ethical issues and computing.

Slide 25:   This slide provides a brief scenario and asks the students to consider a question. Ask the students to write down their thoughts and inform them that you will discuss their ideas in the tutorial for this topic area.

Slide 26:   This slide makes reference to professional computing organisations and introduces A Code of Ethics for Computing.

Slide 27:   This slide provides an overview of Principle One of the Code of Ethics.

Slide 28:   This slide provides an overview of Principle Two of the Code of Ethics.

Slide 29:   This slide provides an overview of Principle Three of the Code of Ethics.

Slide 30:   This slide provides an overview of Principle Four of the Code of Ethics.

Slide 31:   This slide provides an overview of Principle Five of the Code of Ethics.

Slide 32:   This slide provides an overview of Principle Six of the Code of Ethics.

Slide 33:   This slide provides an overview of Principle Seven of the Code of Ethics.

Slide 34:   This slide provides an overview of Principle Eight of the Code of Ethics.

Slide 35:   This slide summarises the main points of the second lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can read further information on some of the subject content recommended on the next slide.

Slide 36:   This slide recommends references/websites that the students can access for further information on the subject content discussed in the first lecture. You can inform students that this is the last slide of Lecture Two.

Lecture Three – 1 hour

Slide 37:   This slide is the first slide of **Lecture Three**. It explains that there are UK laws and guidelines associated with computing.

Slide 38:   This slide provides an overview of the Data Protection Act (1998).

Slide 39:   This slide provides an overview of the role of the UK Information Commissioner.

Slide 40:   This slide provides an overview of Principle One of the Data Protection Act.

Slide 41:   This slide provides an overview of Principle Two of the Data Protection Act.

Slide 42:   This slide provides an overview of Principle Three of the Data Protection Act.

Slide 43:   This slide provides an overview of Principle Four of the Data Protection Act.

Slide 44:   This slide provides an overview of Principle Five of the Data Protection Act.

Slide 45:   This slide provides an overview of Principle Six of the Data Protection Act.

Slide 46:   This slide provides an overview of Principle Seven of the Data Protection Act.

Slide 47:   This slide provides an overview of Principle Eight of the Data Protection Act.

Slide 48:   This slide provides examples of exemptions to the Data Protection Act, that is, when certain parts of the law are not applied.

Slide 49:   This slide states some of the penalties for not adhering to the Data Protection Act.

Slide 50:   This slide provides a link to the Information Commissioner's website as it contains a number of examples of cases where the Data protection Act has been applied.

Slide 51:   This slide states the offences that are dealt with by the Computer Misuse Act (1990).

Slide 52:   This slide describes the penalties for breaching the Computer Misuse Act.

Slide 53:   This slide provides a link to a website that lists recent cases of breaches of the Computer Misuse Act.

Slide 54:   This slide provides a broad overview of the Designs, Patents and Copyrights Act (1988).

Slide 55:   This slide provides information on the duration of copyright.

Slide 56:   This slide provides information on copyright and digital data.

Slide 57:   This slide provides a link to a website that provides information on a recent case that breached the Copyright, Designs and Patents Act

Slide 58:   This slide states examples of computing issues that affect countries on a global scale.

Slide 59:   This slide provides a link to a website that provides information on global computer laws.

Slide 60:   This slide summarises the main points of the third lecture. It is suggested that you remind the students that exercises have been set on these areas and that they can

read further information on some of subject content in the reading recommended on the next slide.

Slide 61: This slide recommends references/websites that the students can access for further information on the subject content that has been discussed in the second lecture

Slide 62: This slide asks the students if they have any questions. Remind them that if they come across information that they do not understand, they will have the opportunity to ask about it during the three tutorials for this topic.

12.6 Laboratory Sessions

The laboratory time allocation for this topic is 1 hour.

Lecturers' Notes:

Students have copies of the laboratory exercises in the Student Guide. Answers are not provided in their guide.

Students will need access to the Internet or a suitable library to complete research tasks.

You will need to allow time for feedback and discussion.

Encourage students to take notes of correct answers suggested by other students.

Exercise: Glossary of terms for Topic Twelve

Produce a glossary of words and terms that you have encountered in this topic.

You can include photographs and/or diagrams to help you to understand the meaning of a word or term

Remember to ask your tutor to clarify any words or abbreviations that are unclear to you.

Suggested Answer:

The students should make reference to all the terms referred to in the lectures for this topic and ideally, they should also include some terms that they have found during their reading/research around the topic.

12.7 Private Study

The time allocation for private study in this topic is expected to be 6 hours.

Lecturers' Notes:

Students have copies of the private study exercises in the Student Guide.

Exercise 1: Cultural issues and computing

In Lecture One (slides eight and thirteen) you were asked to consider the following questions:

- Are computers changing the way in which we communicate with one another?

- Are computers changing how we learn?

- Is automation a positive development?

State whether you agree or disagree with each of the above questions and list the reasons for each of your choices.

Exercise 2: Cultural awareness

Take a look at the following website: http://www.everyculture.com/ and choose a country of your choice. Make a list of five aspects of that country's culture that is different to your culture and list five aspects that are the same.

Exercise 3: Automation – pros and cons

In Lecture Two you were asked to consider a scenario based around the introduction of automation to a factory. Explain the advantages and disadvantages of introducing automation and explain why you think it is ethically acceptable or unethical.

Exercise 4: Monitoring employees at work

Is it appropriate and ethically acceptable that employees are monitored at work, for example, while using e-mail, voicemail, accessing the Internet, their keystrokes?

Exercise 5: The Data Protection Act (1998)

Take a look at the following website: https://ico.org.uk/ and write down information about three cases where the Data Protection Act was not adhered to.

Exercise 6:   Global computing laws

Look at the following website: http://www.cyberlawdb.com/gcld/ Find information about one computing law of the country that you live in or one law in another country and write a few notes about it so that you can share the information at the tutorial.

12.8 Tutorial Notes

The time allowance for tutorials in this topic is 3 hours.

Lecturers' Notes:

Students have copies of the tutorial activities in the Student Guide. Answers are not provided in their guide.

Students should be encouraged to share their answers to the private study tasks. You may like them to do this in small groups before a whole group plenary, depending on the needs and size of your class.

12.8.1 Review of Private Study Exercises

Exercise 1: Cultural issues and computing

In Lecture One (slides eight and thirteen) you were asked to consider the following questions:

- Are computers changing the way in which we communicate with one another?

- Are computers changing how we learn?

- Is automation a positive development?

State whether you agree or disagree with each of the above questions and list the reasons for each of your choices.

Suggested Answer:

Students should provide clear reasons for their opinions. Ideally, they might provide a balanced viewpoint, weighing up the pros and cons, before deciding on a final outcome.

Exercise 2: Cultural awareness

Take a look at the following website: http://www.everyculture.com/ and choose a country of your choice. Make a list of five aspects of that country's culture that is different to your culture and list five aspects that are the same.

Suggested Answer:

Any appropriate examples

Exercise 3: Automation – pros and cons

In Lecture Two you were asked to consider a scenario based around the introduction of automation to a factory. Explain the advantages and disadvantages of introducing automation and explain why you think it is ethically acceptable or unethical.

Suggested Answer:

Reference could be made to:

Better working conditions

- Safer working conditions
- Faster productivity
- Increased leisure time
- Loss of jobs
- Less job satisfaction
- Less compassion shown to workforce

Exercise 4: Monitoring employees at work

Is it appropriate and ethically acceptable that employees are monitored at work, for example, while using e-mail, voicemail, accessing the Internet, their keystrokes?

Suggested Answer:

Reference could be made to:

Improved security

Improved productivity

Improved service

Improved customer relations

Loss of privacy

Loss of trust

Poor job satisfaction

Resentment

Exercise 5: The Data Protection Act (1998)

Take a look at the following website: https://ico.org.uk/ and write down information about three cases where the Data Protection Act was not adhered to.

Suggested Answer:

Any appropriate examples

Exercise 6:   Global computing laws

Look at the following website: http://www.cyberlawdb.com/gcld/ Find information about one computing law of the country that you live in or one law in another country and write a few notes about it so that you can share the information at the tutorial.

Suggested Answer:

Any appropriate examples