



education

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**NATIONAL CURRICULUM STATEMENT
GRADES 10-12 (GENERAL)**

LEARNING PROGRAMME GUIDELINES

INFORMATION TECHNOLOGY

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ACRONYMS

ACM	: Association of Computing Machinery
AI	: Artificial Intelligence
ATM	: Automatic Teller Machine
AS	: Assessment Standard
BIOS	: Basic Input-Output System
CAI	: Computer-Aided Instruction
CASS	: Continuous Assessment
CD	: Compact Disk
CD-ROM	: Compact Disk Read-Only Memory
CO	: Critical Outcomes
DO	: Developmental Outcomes
E-, e-	: Electronic
EMS	: Economic and Management Sciences
FET	: Further Education and Training
GET	: General Education and Training
GUI	: Graphical User Interface
HCI	: Human-Computer Interaction
HG	: Higher Grade
ICT	: Information and Communication Technology
IKS	: Indigenous Knowledge Systems
IRC	: Internet Relay Chat
ISP	: Internet Service Provider
IT	: Information Technology
LO	: Learning Outcome
LoLT	: Language of Learning and Teaching
LPG	: Learning Programme Guideline
LTSM	: Learner and Teacher Support Material
NCS	: National Curriculum Statement
NQF	: National Qualification Framework
NSC	: National Senior Certificate
OBA	: Outcomes-Based Assessment
OBE	: Outcomes-Based Education
OSI	: Open Systems Interconnect
PoA	: Programme of Assessment
SAG	: Subject Assessment Guidelines
SAQA	: South African Qualifications Authority
SBA	: School-Based Assessment
KSV	: Knowledge, Skills and Values
SF	: Subject Framework
UK	: United Kingdom
VAT	: Value Added Tax
WS	: Work Schedule

SECTION 1

INTRODUCTION

1.1 INTRODUCING THE NATIONAL CURRICULUM STATEMENT

1.1.1 BACKGROUND

In 1995 the South African government began the process of developing a new curriculum for the school system. There were two imperatives for this. First, the scale of change in the world, the growth and development of knowledge and technology and the demands of the 21st Century required learners to be exposed to different and higher level skills and knowledge than those required by the existing South African curricula. Second, South Africa had changed. The curricula for schools therefore required revision to reflect new values and principles, especially those of the Constitution of South Africa.

The first version of the new curriculum for the General Education Band, known as Curriculum 2005, was introduced into the Foundation Phase in 1997. While there was much to commend the curriculum, the concerns of teachers led to a review of the Curriculum in 1999. The review of Curriculum 2005 provides the basis for the development of the National Curriculum Statement for General Education and Training (Grades R – 9) and the National Curriculum Statement for Grades 10–12.

1.1.2 THE NATIONAL CURRICULUM STATEMENT

The National Curriculum Statement consists of 29 subjects. Subject specialists developed the Subject Statements which make up the National Curriculum Statement. The draft versions of the Subject Statements were published for comment in 2001 and then re-worked to take account of the comments received. In 2002 24 subject statements and an overview document were declared policy through Government Gazette. In 2004 five subjects were added to the National Curriculum Statement. The National Curriculum Statement now consists of the Subject Statements for the following subjects:

- Languages – 11 official languages (each counted as three subjects to cater for the three levels Home Language, First Additional Language and Second Additional Language); 13 non-official languages
- Mathematics; Mathematical Literacy; Physical Sciences; Life Sciences; Computer Applications Technology; Information Technology
- Accounting; Business Studies; Economics
- Geography; History; Life Orientation; Religion Studies
- Consumer Studies; Hospitality Studies; Tourism
- Dramatic Arts; Dance Studies; Design; Music; Visual Arts
- Agricultural Sciences, Agricultural Management Practices, Agricultural Technology

- Civil Technology; Mechanical Technology; Electrical Technology; Engineering Graphics and Design

1.1.3 NATIONAL SENIOR CERTIFICATE

The *National Senior Certificate: A Qualification on Level 4 of the National Qualifications Framework (NQF)* provides the requirements for promotion at the end of Grades 10 and 11 and the awarding of the National Senior Certificate at the end of Grade 12. This document replaces two of the original National Curriculum Statement documents: the *Overview* and the *Qualifications and Assessment Policy Framework*.

1.1.4 SUBJECT ASSESSMENT GUIDELINES

The Subject Assessment Guidelines set out the internal or school-based assessment requirements for each subject and the external assessment requirements. In addition, the *National Protocol for Recording and Reporting (Grades R-12)* (an addendum to the policy, *The National Senior Certificate*) has been developed to standardise the recording and reporting procedures for Grades R to 12. This protocol came into effect on 1 January 2007.

1.2 INTRODUCING THE LEARNING PROGRAMME GUIDELINES

1.2.1 PURPOSE AND CONTENT OF THE LEARNING PROGRAMME GUIDELINES

The Learning Programme Guidelines aim to assist teachers and schools in their planning for the introduction of the National Curriculum Statement. The Learning Programme Guidelines should be read in conjunction with the National Senior Certificate policy and the National Curriculum Statement Subject Statements.

Section 2 of the Learning Programme Guidelines suggests how teaching the particular subject may be informed by the principles which underpin the National Curriculum Statement.

Section 3 suggests how schools and teachers might plan for the introduction of the National Curriculum Statement. The Department of Education encourages careful planning to ensure that the high skills, high knowledge goals of the National Curriculum Statement are attained.

The Learning Programme Guidelines do not include sections on assessment. The assessment requirements for each subject are provided in the Subject Assessment Guidelines which come into effect on 1 January 2008.

1.2.2 WHAT IS A LEARNING PROGRAMME

INTRODUCTION

A Learning Programme assists teachers to plan for sequenced learning, teaching and assessment in Grades 10 to 12 so that all Learning Outcomes in a subject are achieved in a progressive manner. The following three phases of planning are recommended:

Phase 1 – develop a *Subject Framework* for grades 10 to 12

Phase 2 – develop a *Work Schedule* for each grade

Phase 3 – develop *Lesson Plans* to cover each classroom contact session

It is recommended that the teachers of a subject at a school or cluster of schools first put together a broad subject outline (Subject Framework) for the three grades to arrive at an understanding of the content of the subject and the progression which needs to take place across the grades (see Section 3.3.1). This will assist with the demarcation of content for each grade. Thereafter, teachers of the subject teaching the same grade need to work together to develop a year long Work Schedule. The Work Schedule should indicate the sequence in which the content and context will be presented for the subject in that particular grade (see Section 3.3.2). Finally, individual teachers should design Lesson Plans using the grade-specific Work Schedule as the starting point. The Lesson Plans should include learning, teaching and assessment activities that reflect the Learning Outcomes and Assessment Standards set out in the Subject Statements (see Section 3.3.3). Learning Programmes should accommodate diversity in schools and classrooms but reflect the core content of a national curriculum.

An outline of the process involved in the design of a Learning Programme is provided on page 6.

DESIGNING A LEARNING PROGRAMME

A detailed description of the process involved in the design of a Learning Programme is provided in Sections 3.3.1 – 3.3.3 of the Learning Programme Guidelines. The first stage, the development of a Subject Framework does not require a written document but teachers are strongly advised to spend time with subject experts in developing a deep understanding of the skills, knowledge and values set out in the Subject Statements. The quality and rigour of this engagement will determine the quality of teaching and learning in the classroom.

Once the Subject Framework has been completed, teachers should develop Work Schedules and Lesson Plans. Examples of Work Schedules and Lesson Plans are provided in the Learning Programme Guidelines. Teachers are encouraged to critically engage with these formats and develop their own.

• *Developing a Subject Framework (Grades 10-12)*

Planning for the teaching of subjects in Grades 10 to 12 should begin with a detailed examination of the scope of the subject as set out in the Subject Statement. No particular format or template is recommended for this first phase of planning but the steps recommended should be used as a checklist.

Although no prescribed document is required for this stage of planning, school-wide planning (timetables, requisitioning, teacher development, classroom allocation) as well as the development of grade-specific work schedules would benefit from short documents which spell out:

- The scope of the subject – the knowledge, skills and values; the content; the contexts or themes; electives etc. to be covered in the three grades for each subject
- A three-year assessment plan for the subject
- The list of LTSM required for the subject

- ***Designing Work Schedules***

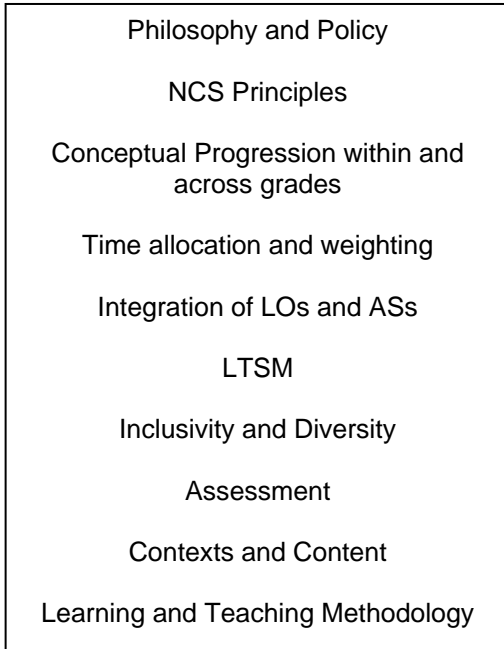
This is the second phase in the design of a Learning Programme. In this phase teachers develop Work Schedules for each grade. The Work Schedules are informed by the planning undertaken for the Subject Framework. The Work Schedules should be carefully prepared documents that reflect what teaching and assessment will take place in the 36-40 weeks of the school year.

- ***Designing Lesson Plans***

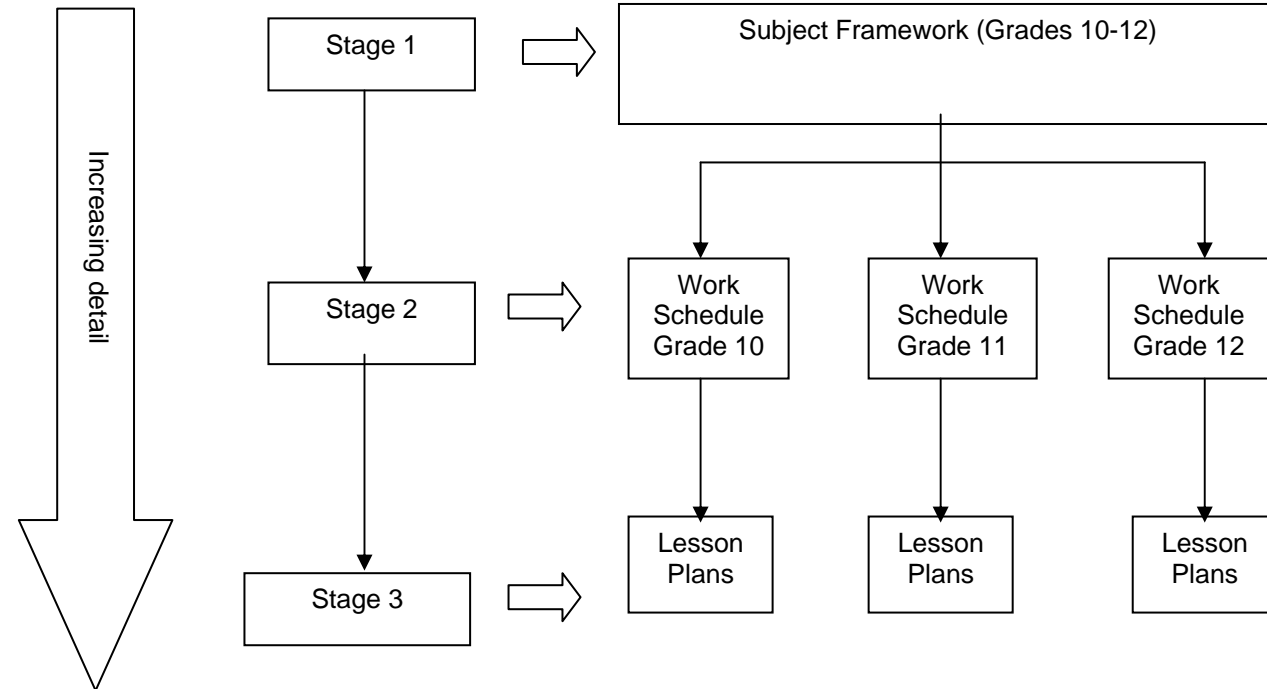
Each grade-specific Work Schedule must be divided into units of deliverable learning experiences, that is, Lesson Plans. Lesson Plans are not equivalent to periods in the school timetable. Each Lesson Plan should contain a coherent series of teaching, learning and assessment activities. A Lesson Plan adds to the level of detail for each issue addressed in the Work Schedule. It also indicates other relevant issues to be considered when teaching and assessing a subject.

FIGURE 1: RELATIONSHIP BETWEEN THE 3 STAGES OF PLANNING WHEN DEVELOPING A LEARNING PROGRAMME

ISSUES TO BE CONSIDERED



STAGES



SECTION 2

INTRODUCING INFORMATION TECHNOLOGY

This section must be read in conjunction with the National Curriculum Statement Grades 10 – 12 (General) for Information Technology.

2.1 WHAT IS INFORMATION TECHNOLOGY?

Information Technology originates from and is a subset of the broader knowledge domain of information and communication technologies (ICTs). ICTs are the combination of networks, hardware and software and the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge. ICTs develop rapidly and include the following broad knowledge categories that impact on Information Technology:

- Personal computer hardware and software;
- Network hardware and software;
- Other computer hardware and software;
- Use of ICTs to solve problems;
- Impact of ICTs on society;
- Cellphone technology; and
- Video, audio, radio and other digital technologies.

2.2 WHAT IS THE PURPOSE OF INFORMATION TECHNOLOGY?

Information Technology is learning about and working with ICTs. The subject is designed to:

- Higher-order thinking skills – the ability to understand the complex relationships and interdependencies between concepts, structures and processes;
- Technology skills – the ability to use the facilities of technology and operate them purposefully and effectively;
- Information skills – the ability to access, retrieve, store, organise, manipulate, evaluate, maintain, analyse, interpret, present and communicate information and to use ICTs to process information;
- Problem-solving skills – the application of an authentic methodology to solve problems in an irregular range of cases by using digital technology;
- Creative skills – the ability to design, develop and produce creative and elegant solutions;
- Collaborative skills – the ability to develop multifaceted and multileveled systems through collaborative teamwork; and
- Lifelong learning skills – the ability to achieve and maintain the knowledge, skills, values and attitudes required in a dynamic knowledge domain.

Information Technology teaches learners:

- A deep understanding of the concepts and principles of the hardware and software of ICTs;
- To use digital technology to solve problems; and
- Programming as the process of designing, developing and implementing software systems to solve particular problems.

2.3 WHAT IS THE RELATIONSHIP BETWEEN INFORMATION TECHNOLOGY AND THE NATIONAL CURRICULUM STATEMENT PRINCIPLES?

2.3.1 Why is Information Technology included in the National Curriculum Statement for South African schools?

The knowledge and skills acquired in Information Technology enable learners to use information and communication technologies (specifically computers) in social and economic applications, systems analysis, problem solving (using either applications or a current object-oriented programming language), logical thinking and information management and communication. It is envisaged that the fundamental knowledge, skills, and values developed will not be restricted to Information Technology but will also relate to applications in other subjects in Grades 10 – 12 and beyond.

In order for South Africa to be competitive in the global economy, it will need to develop a workforce with appropriate Information Technology skills. Of necessity, these skills will extend beyond using a computer as merely a tool and include software development and technical support skills. This subject will provide learners with the necessary background skills to enable them to specialise in IT-related fields and make appropriate career choices in this industry.

2.3.2 How does Information Technology use the key principles of the National Curriculum Statement?

The National Curriculum Statement lists nine *principles* that must inform all teaching and learning.

Human rights, inclusivity and environmental and socio-economic justice

These issues are dealt with in the Learning Outcomes of Information Technology and the teachers must ensure that learners understand and appreciate the role that computers played in the past with regards to human rights, inclusivity and environmental and socio-economic justice.

Integration and progression

Integration with other subjects enhances learners' language, research and creativity skills while skills acquired in Information Technology can be transferred to other subjects by learners. The format of the curriculum leads to content being studied in greater complexity and depth both within and across each grade resulting in progression and the development of higher-level skills.

The skills, knowledge and attitudes acquired in Information Technology assist learners to meet the Learning Outcomes in subjects such as Mathematics, Mathematical Literacy, Physical Sciences, Electrical and Mechanical Technology and Life Orientation.

Outcomes-based education

Computer Studies, the forerunner of Information Technology, has always been taught with Learning Outcomes in mind where learners developed solutions to problems. This approach has been continued and extended in Information Technology. The problems are linked to real-life situations to make learning more immediate and practical. For example, in rural areas the problems could relate to computer use in agriculture whilst in urban areas they could relate to computing in the banking or retail sector.

Credibility, quality, efficiency and relevance

During the development of the Subject Statement a number of international publications, various websites and leaders and academics in the IT industry were consulted to ensure that the curriculum meets internationally acceptable standards. The Subject Statement compares favourably with the recommendations of the Association of Computing Machinery (ACM) High School Information Technology curriculum and similar subjects in the United Kingdom, Australia and Canada.

The content includes not only the study of a programming language but also the development of databases, spreadsheets and websites and pages that integrate with one another. This content mirrors the manner in which these development tools are used in commerce and industry. For example, many websites that require a user to enter data into a form are connected to databases – the web page acts as a specific type of user interface to the database. Similarly, many large systems are based on a database where a programme is used to access and manipulate the data.

High levels of knowledge and skills for all

The National Curriculum Statement for Grades 10 – 12 aims to develop a high level of knowledge and skills for all learners. The Information Technology curriculum fulfils this aim by promoting problem solving, system development skills and conceptual thinking and understanding in learners irrespective of personal barriers to learning. This acquired knowledge will enable learners to develop solutions to clearly defined problems within their frame of reference and to contribute to the Information Technology industry in South Africa, increasing South Africa's global competitive edge.

Articulation and portability

The Learning Outcomes, Assessment Standards and content framework allow for portability across and within the Further Education and Training Band and facilitate access to the Higher Education and Training Band. The Learning Outcomes and Assessment Standards reflect the South African Qualifications Authority level descriptors for National Qualifications Framework levels 2, 3 and 4.

Social transformation

The imperative to transform South African society stems from the need to address the imbalances of the past, specifically in the field of Information and Communication Technology. Since 1994, the government has introduced redress and empowerment policies as part of its reconstruction and development endeavours. In Grade 10 Learning Outcome 3, Assessment Standards 1 and 2, learners are required to engage with the broad economic reasons for using computers and to discuss the effects of the use of computers across a range of application areas. In Grades 11 and 12, the Assessment Standards of Learning Outcome 3 also address this issue.

Applied competence

Applied competence aims at integrating practical, foundational and reflective competencies. Information Technology seeks to promote the integrated learning of theory, practice and reflection.

Indigenous knowledge systems (IKS)

The National Curriculum Statement Grades 10-12 (General) accepts that there are competing perspectives and worldviews with which to make sense of and understand phenomena. A curriculum based on this view must recognise these different perspectives and worldviews. In the South African context, it is crucial to recognise and value indigenous knowledge systems to affirm the majority of people.

Indigenous knowledge systems incorporate ways of doing and thinking associated with indigenous local communities in our country, region and continent. All subjects that form part of the National Curriculum Statement Grade 10-12 (General) have integrated elements of indigenous knowledge into their field of study.

2.4 PROFILE OF A INFORMATION TECHNOLOGY LEARNER ENTERING THE FURTHER EDUCATION AND TRAINING BAND

Information Technology concentrates on the development of solutions using both programming and application packages. Learners who wish to study application packages and their uses in a variety of situations are encouraged to study Computer Applications Technology.

The learner most likely to succeed in this subject will show evidence of:

- sound communication skills in the language of teaching and learning (LoLT),
- better than average abilities in Mathematics,
- logical thinking skills,
- problem-solving skills,
- proficiency with and interest in technology, and
- an aptitude for computers that goes beyond the use of applications and game playing.

At the end of Grade 12 an Information Technology learner will be able to:

- Analyse factors affecting the overall performance of a computer-based system;
- Produce reports on common problems in computer configurations which identify standard troubleshooting procedures;
- Recommend a hardware solution for a given problem;
- Recommend an operating system for a specific hardware configuration;
- State and discuss the implications of the latest computer technologies;
- Critically assess Internet security and its implications;
- Propose and justify strategies to protect the value of information produced and communicated by an organisation;
- State and discuss how the latest technologies facilitate human interaction;
- Analyse the effects of the use of computers across a range of applications;
- Research and report on the ethical issues relating to the use of computers;
- Comment on the use of computers to provide solutions to issues of national and international importance
- Comment critically on the social, political, economic and other consequences of search engines and group communities;
- Explain the responsible use, purpose and significance of any new computer developments;
- Manipulate real-world data using advanced techniques such as what-if scenarios using spreadsheets;
- Explain the principles of good navigation between different screens of a user-written application, starting from a multi-function menu;
- Design, for a real-world application, a system of several interlinked screens which can successfully be navigated by end-users and members of the public;
- Apply the principles of object-orientated data structuring for classes and collections;
- Implement solutions to simple problems requiring collections of data in a programming environment;
- Explain the danger of software which has bugs in it;
- Use a debugger to efficiently find programming errors;
- Understand the necessity of using automatically-generated or fetched test data for interactive and database systems;
- Interpret and analyse the output of a computerised system;
- Know the principles of normalisation for data in databases and apply them to avoid repetition of data;

- Use a multi-table database to produce advanced queries and reports;
- Query a database via an application package and a programming language;
- Demonstrate the integration of data between various application packages;
- Implement an effective online help system for an existing or new software application; and
- Produce well-written and well-presented documentation for an existing or new software application.

2.5 RELATIONSHIP BETWEEN THE INFORMATION TECHNOLOGY LEARNING OUTCOMES AND CRITICAL AND DEVELOPMENTAL OUTCOMES

2.5.1 The National Curriculum Statement Critical and Developmental Outcomes

Education in South Africa is informed by seven Critical Outcomes and five Developmental Outcomes that derive from the Constitution of South Africa, Act 108 of 1996. Each describes an essential characteristic of the type of South African citizen the education sector hopes to produce. These Critical and Developmental Outcomes, therefore, should be reflected in the teaching style and methodologies of the teacher and in the learning activities and experiences of the learners. Both the teacher and the learners must be aware of and focus on these Critical and Developmental Outcomes, which should be addressed throughout the teaching and learning process.

The Critical Outcomes (CO) stipulate learners should be able to:

Critical Outcome 1:

Identify and solve problems in which the responses display that responsible decisions have been made using critical and creative thinking.

The focus of Information Technology is the development of effective software solutions for specific problems. Outside of the creative arts, programming is one of the most creative human activities. This calls for teaching approaches and methodologies that do not simply transfer facts with the expectation that learners recall them in tests or other assessment activities.

The enquiry approach is an important strategy to help learners solve problems. They must develop the skill of asking key questions that direct investigation and indicate signposts on the path to understanding. The typical questions that could be asked are:

- What is the issue or problem?
- Who or what is involved?
- How can the problem or issue be effectively and efficiently resolved?
- Does a solution already exist or does one have to be developed?
- What impact does it have and with what consequences?
- How should it be dealt with or managed?

Critical Outcome 2:

Work effectively with others as members of a team, group, organisation and community.

In large corporations systems are usually developed by more than one person. In order to simulate this environment and encourage learners to work together, group performance assessments should be set where appropriate.

By working in groups, learners learn that working together not only leads to growth for all group members but also helps complete tasks that would otherwise have been very difficult, if not

impossible, if dealt with by an individual. Learners experience the joy of attainment and success much more easily and quickly.

Critical Outcome 3:

Organise and manage themselves and their activities responsibly and effectively.

The study of Information Technology provides learners with the opportunity to develop a range of skills that they can use and apply throughout their lives, like management skills, which include organisation and time management. A good strategy to develop these skills is to request learners to explain their planning when they submit a completed task.

Specifically, the performance assessment work in the subject will require learners to plan, organise, manage and report on their activities and time to meet performance assessment deadlines.

Critical Outcome 4:

Collect, analyse, organise and critically evaluate information.

As learners investigate topics they will have to collect relevant information, organise the information acquired in different formats, for example graphs, maps and flow charts, which enhance the process of understanding, analysing (breaking down in basic components) and synthesising (putting together) the information and evaluate and apply their findings to the world in which they live.

Specifically, the research and reporting activities built into the subject and the issues surrounding the management of information addressed in Learning Outcome 4 will ensure that learners achieve this Critical Outcome.

Critical Outcome 5:

Communicate effectively using visual, symbolic and/or language skills in the modes of oral and/or written presentation.

The research and reporting activities built into the subject will ensure that learners achieve this Critical Outcome. In addition, by using software packages such as Microsoft PowerPoint and electronic communications, learners will acquire the ability to effectively communicate various types of information and ideas and to communicate with others. Assessment of research and other tasks will also include oral feedback in a seminar-type situation.

Critical Outcome 6:

Use science and technology effectively and critically showing responsibility towards the environment and the health of others.

Learning Outcome 3 specifically addresses these issues.

Critical Outcome 7:

Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

In this subject, learners study a variety of case studies in which computers are used. Many of these case studies will show the interdependence and interaction of various systems.

The five Developmental Outcomes are:

Developmental Outcome 1:

Reflect on and explore a variety of strategies to learn more effectively.

Learning Outcome 4 includes aspects of problem solving where individual and group work is encouraged through performance assessment work. The strategies used in the subject include oral presentations, seminars, written work, practical work, etc. which allow for a variety of learning modes. In addition, the subject makes specific use of web-based resources to ensure that the information used is current.

Developmental Outcome 2:

Participate as responsible citizens in the life of local, national and global communities.

Learning Outcome 3 is geared towards addressing this Developmental Outcome.

Developmental Outcome 3:

Be culturally and aesthetically sensitive across a range of social contexts.

Learning Outcome 3 is also geared towards addressing this Developmental Outcome.

Developmental Outcome 4:

Explore education and career opportunities.

In general, all Learning Outcomes are aimed at addressing this Developmental Outcome. Learning Outcome 3 addresses issues pertaining to career opportunities whilst the other Learning Outcomes provide the learner with skills appropriate to either continuing in higher education or moving into the workplace.

The teacher must sensitise learners to career opportunities which could result from studying Information Technology. Learners need to be introduced as much as possible to organisations and people working in computer-related fields. They need to be encouraged to attend career exhibitions or visit places of work and higher education and other training institutions to witness the career opportunities available to them.

Developmental Outcome 5:

Develop entrepreneurial opportunities.

Information Technology will provide learners with a broad range of computing and problem-solving skills that will enable them to take up many entrepreneurial opportunities.

Table 2.1 summarises the links between the Learning Outcomes for Information Technology and the Critical and Developmental Outcomes

Table 2.1: Information Technology Outcomes and the Critical and Developmental Outcomes

	CO1	CO2	CO3	CO4	CO5	CO6	CO7	DO1	DO2	DO3	DO4	DO5
LO1	*			*			*		*		*	*
LO2	*	*	*	*	*	*	*	*	*	*	*	*
LO3		*	*	*		*	*		*	*	*	*
LO4	*	*	*	*	*		*	*	*		*	*

2.5.2 The GET Learning Outcomes

There are no direct links between Information Technology and any of the Learning Areas in the General Education and Training Band. However, the following Learning Outcomes in the Technology Learning Area link indirectly to the Learning Outcomes in Information Technology:

Table 2.2: Technology Learning Outcomes and IT Learning Outcomes

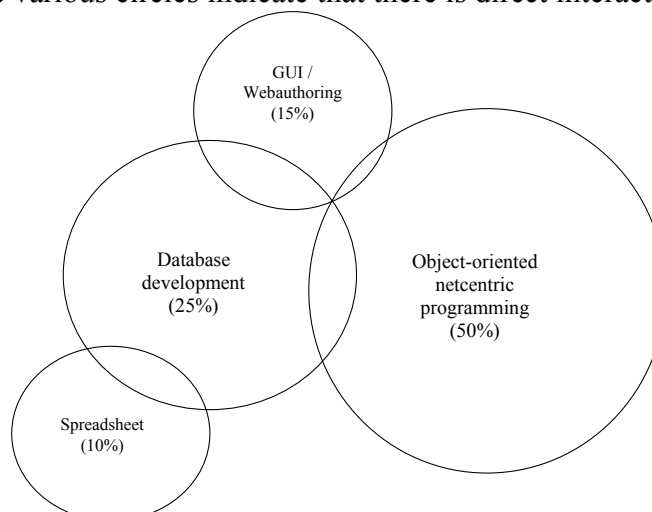
NCS (Grades R – 9) Technology Learning Area Learning Outcomes	NCS (Grade 10 – 12) IT Learning Outcomes
1	1
1, 2	2
1, 2, 3	3
1	4

2.6 WAYS TO ACHIEVE INFORMATION TECHNOLOGY LEARNING OUTCOMES

2.6.1 The approach to the teaching of Information Technology

Since its introduction in 1978, Computer Studies HG concentrated on problem solving using a computer and developing programmes as a vehicle for the problem solving. This was primarily because of the lack of suitable application packages.

The business, commercial, industrial and scientific communities have in the meantime moved towards integrating applications (specifically databases, spreadsheets and website or pages) with programming languages. Consequently, in many instances, databases are used as data repositories (warehouses) with a spreadsheet, web page or a computer programme interfacing with the data. Therefore, the development tools in Information Technology have changed to reflect this changed use. The following diagram provides an idea of how the development tools interact with one another and the relative weightings (time and mark allocation) of each development tool in the subject. The overlaps between the various circles indicate that there is direct interaction between the development tools:



Traditionally, Computer Studies is taught mainly as discrete topics and there is very little integration of topics. Conversely, Information Technology uses case studies, scenarios or themes that naturally lead to the integration of a variety of topics.

Examples:

- Scenario 1 - Use of the Internet for communication purposes
This includes aspects, such as hardware and software required, Internet services required and the responsible uses of electronic communication. Learning Outcomes 1, 2 and 3 are covered at the same time.
- Scenario 2 - Problem solving by using applications
This entails the development of a solution to a problem dealing with the interaction between a database, a spreadsheet and a web page. This could involve Learning Outcomes 1, 2, 3 and 4.

2.6.2 What is the approach to content?

As Information Technology is a dynamic subject, some of the content is likely to change at a very rapid rate. Therefore, the approach to content has to be flexible in allowing content to be revised to allow for changing circumstances and rapid advances in technology.

Content forms an integral part of the subject matter and it is critical to apply this content to real-life situations. This can be achieved by examining various case studies that link content to actual Information Technology situations. Examples of this include computing in the retail sector, in industry, in education and in health.

Textbooks should not be considered as the only source of content as they can rapidly become outdated. Other relevant sources, such as newspaper, magazine and journal articles, radio or television reports and Internet sites need to be incorporated into the content.

Learners could also consider keeping a *journal* (similar to a scrapbook) in which they record and comment on current developments in technology. This will help them develop their research report which forms an integral part of the Programme of Assessment, specifically in Grade 12.

Teachers should consider the time available to cover all aspects of Information Technology to ensure that the learners meet all the Assessment Standards and each Learning Outcome. There must be a balance between depth and breadth so as not to overload the subject.

2.6.3 The interrelationship of Learning Outcomes and content and contexts

The four Learning Outcomes of Information Technology are integrated and not presented in any specific order. They should not be taught sequentially as each supports and underpins the other. This approach supports and expands learners' opportunities to attain skills, acquire knowledge and develop values and attitudes across the curriculum.

In a manner similar to the various layers in the Open Systems Interconnect (OSI) model, the Learning Outcomes have been developed in such a way that each supports and complements the other. The one cannot be studied without the other.

Learning Outcome 1 essentially deals with computer hardware (in its various forms) and the software that is required to 'drive' the hardware (i.e. operating systems, device drivers, etc.). This Learning Outcome forms the underlying foundation on which the other Learning Outcomes are based.

Learning Outcome 2 emphasises electronic communication that uses the infrastructure developed in Learning Outcome 1.

Learning Outcome 4 is the more heavily weighted Learning Outcome, as it is the crux of the subject: the development of systems using various development tools. However, to implement the systems that are developed, learners need the concepts established in Learning Outcomes 1 and 2.

2.6.4 How will the Learning Outcomes be used in Information Technology?

The Learning Outcomes and Assessment Standards form the framework around which the Learning Programme is built, and therefore, will direct learning, determine content and identify learning activities and possible means of assessment that will enable the learner to demonstrate competency.

Each Learning Outcome has its own Assessment Standards that give more detail with regards to content and context. The Assessment Standards describe ways to achieve the Learning Outcomes and define the levels of progression within and across each grade in Grade 10 – 12. The level at which each of the Learning Outcomes and/or the subject has been achieved can be described as a competence.

2.6.5 What content will be covered and how will it be dealt with?

Annexure A provides the link between each of the Learning Outcomes and the Assessment Standards and gives a brief description of content for each Assessment Standard. The teacher should be aware that some of the content could be dealt with in more than one Learning Outcome.

As this is a dynamically evolving subject development tools will arise. Where these supersede the tools indicated in the Subject Statement, the guidelines will be adapted to remain relevant.

The content will be dealt with in various scenarios in Grades 10 – 12. Case studies should provide background information on various topics and should show how all the topics are integrated with one another.

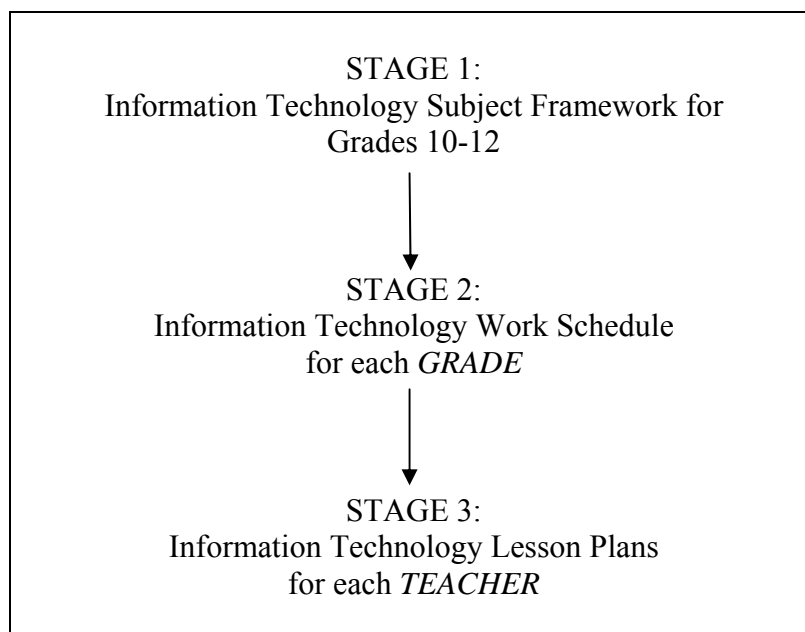
SECTION 3

DESIGNING A LEARNING PROGRAMME FOR INFORMATION TECHNOLOGY

3.1 INTRODUCTION

A Learning Programme is a tool to plan for sequenced learning, teaching and assessment across Grades 10-12 so that all four Learning Outcomes in Information Technology are achieved in a progressive manner. It is recommended that the Information Technology teachers at a school first put together a broad subject outline (i.e. Subject Framework) for Grades 10-12 to arrive at an understanding of the progression which needs to take place across the grades (see Section 3.3.1). This will assist with the demarcation of content for each grade. Thereafter, Information Technology teachers teaching the same grade need to work together and draw from the content and context identified for their grade in the Subject Framework, to develop a Work Schedule in which they indicate the sequence in which the content and context will be presented for Information Technology in that particular grade (see Section 3.3.2). Finally, the individual Information Technology teacher should design Lesson Plans using the grade-specific Work Schedule as the starting point. The Lesson Plans should include learning, teaching and assessment activities (see Section 3.3.3).

An outline of the process involved in the design of a Learning Programme for Information Technology is provided in the diagram below:



The process to be followed in the development of a Learning Programme is not a neatly packaged sequence of numbered steps that follow one another in a particular order. Teachers may find themselves moving back and forth in the process as they plan and critically reflect on decisions taken before moving on to the next decision in the process. The process is therefore not strictly linear and is reflective in nature. For this reason the steps provided in this Section are a guide and should be used as a checklist in the planning process.

3.2 ISSUES TO ADDRESS WHEN DESIGNING A LEARNING PROGRAMME

The issues to be addressed in the development of a Information Technology Learning Programme are presented in a tabular format to indicate the implications of each issue at each of the three stages of the development of a Learning Programme:

- Stage 1 – Subject Framework
- Stage 2 – Work Schedule
- Stage 3 – Lesson Plan

3.2.1 Policies and Principles

STAGE 1 SF	While the various Policies that impact on curriculum implementation and the NCS Principles are not recorded on the planning sheets of a Learning Programme, evidence of their use will be seen in the planning product. They, therefore, need to be taken into account throughout the planning process from Stages 1-3.
STAGE 2 WS	
STAGE 3 LP	

NCS:
Principles: Refer to Section 2.3 to see how Information Technology supports the application of the nine principles of the NCS
Critical Outcomes and Developmental Outcomes: Refer to Section 2.5 to see how Information Technology supports the application of the Critical and Developmental Outcomes
Other Policies and Legislation:

- White Paper 6, Language in Education Policy, Religion & Education Policy, HIV/AIDS – all indicate how to accommodate diversity and therefore have implications for LTSM and teaching methods in Information Technology
- White Paper 7(e-Education) defines ICTs and gives an indication of learning about ICTs, learning with ICTs and learning through the use of ICTs. It therefore has implications for LTSM and teaching methods in Information Technology

3.2.2 Content

In the NCS Grades 10-12 content means the combination of knowledge, skills and values.

STAGE 1 SF	The content is provided by the ASs. These give an indication of the knowledge, skills and values (KSVs) to be covered in each of the three grades. The Subject Framework sets out the content for the three years (i.e. Grades 10, 11 and 12).
STAGE 2 WS	The Work Schedule sets out the content for one year. Here the focus falls on the grade-specific KSVs required by the NCS.
STAGE 3 LP	The Lesson Plans set out the content to be covered in each coherent series of learning, teaching and assessment activities. Each Lesson Plan can be one or more weeks in duration.

Refer to Annexure A for content.

3.2.3 Integration

Integration involves the grouping of Assessment Standards according to natural and authentic links.

STAGE 1 SF	Integration within the subject should be considered in broad terms during discussions at this stage. All Grade 10-12 teachers should consider integration of ASs within and across the grades.
STAGE 2 WS	The integration and sequencing of the ASs is undertaken in the Work Schedule to ensure that all ASs for a particular grade are covered in the 40-week contact period.
STAGE 3 LP	The same groupings of LOs and ASs as arrived at in the Work Schedule should be used to develop a coherent series of learning, teaching and assessment activities for each Lesson Plan.

3.2.4 Conceptual Progression

STAGE 1 SF	The Subject Framework should indicate the increasing depth of difficulty across Grades 10-12. Progression across the three grades is shown in the ASs per Learning Outcome.
STAGE 2 WS	Progression in a grade is evident in the increasing depth of difficulty in that particular grade. Grade-specific progression is achieved by appropriately sequencing the groupings of integrated LOs and AS in the Work Schedule.
STAGE 3 LP	In the individual Information Technology classroom increasing depth of difficulty is shown in the activities and Lesson Plans. Progression is achieved by appropriately sequencing the activities contained within each Lesson Plan and in the series of Lesson Plans.

3.2.5 Time Allocation and Weightings

STAGE 1 SF	4 hours per week is allocated to Information Technology in the NCS. This is approximately 160 hours per year. The teachers of the subject should plan how this time will be used for the teaching of Information Technology in the three grades.
STAGE 2 WS	The groupings of ASs as arrived at in the integration process should be paced across the 40 weeks of the school year to ensure coverage of the curriculum.
STAGE 3 LP	The amount of time to be spent on activities should be indicated in the Lesson Plans.

The Learning Outcomes are not equally weighted so the time allocated to each scenario should not exceed the weighted times. If more time is spent on any particular Learning Outcome or Assessment Standard than warranted, there will be less time available to achieve the other Learning Outcomes or Assessment Standards.

The time allocations in Table 3.1 are deliberately listed as percentages to accommodate varying times available for teaching-learning activities across the grades. Therefore, the total actual teaching-learning time available needs to be determined to quantify the amount of time allocated.

Table 3.1: Time allocation

LEARNING OUTCOME	WEIGHTING
1	20%
2	10%
3	10%
4	60%

3.2.6 LTSM (Resources)

LTSM refers to any materials that facilitate learning and teaching. LTSM need to be chosen judiciously because they have cost implications for the school and the learner. The NCS provides scope for the use of a variety of resources. All teachers and learners must have a textbook. However, teachers are required to go beyond the textbook. They do not necessarily need exotic, specialised materials. Rather common and readily available items can be used.

STAGE 1 SF	Compile a list of general LTSM (text books and other resources) that will be necessary and useful in the teaching, learning and assessment of the content. This assists with the requisition and availability of LTSM at a school.
STAGE 2 WS	List grade-specific LTSM (resources) required in the learning, teaching and assessment process for the grade.
STAGE 3 LP	Identify specific resources related to the individual activities contained within a Lesson Plan.

3.2.7 Assessment

In order to administer effective assessment one must have a clearly defined purpose. By answering the following questions the teacher can decide what assessment activity is most appropriate:

- What concept, skill or knowledge needs to be assessed?
- What should the learners know or be able to do?
- At what level should the learners be performing?
- What type of knowledge is being assessed: reasoning, memory or process?

The Subject Assessment Guidelines for Information Technology provide teachers with a formal Programme of Assessment. The Programme of Assessment for Information Technology consists of seven tasks which are all internally assessed.

Information Technology also includes a Practical Assessment Task (PAT). This is a project and should be administered through the first three terms according to set dates for completion of each stage of the project.

A **Grade 10** learner needs to demonstrate an understanding of the basics of stand-alone computer hardware and software (including the operating system) and how to responsibly use various Internet services, including e-mail and the World Wide Web. A learner is also expected to show insight into the broad economic reasons for using computers, their application in society as a whole and a general awareness of the positive and negative impact on health and environmental issues. In addition, a Grade 10 learner should have mastered basic programming techniques including sequence, selection and iteration. The learner should also be able to use spreadsheets and databases at a fairly elementary level.

A **Grade 11** learner should have a thorough understanding of the essentials of networked environments and be skilled in more advanced uses of e-mail and group communications, effective web searches and the transfer of files across the Internet. The learner should show an awareness of careers in computers and general global technology trends and issues. From a software development point of view, the learner should be able to design and write programs that include advanced data structures and create and query multi-table databases and use spreadsheets to produce mathematically based tables and charts.

A **Grade 12** learner must be able to analyse and troubleshoot computer-based systems in terms of their performance and the needs of users. A learner should also be able to analyse web-based resources and show an understanding of securing access to electronic data and of ethical issues as well as issues of national and international importance relating to the use of computers. A Grade 12 learner should be able to design, debug and develop fairly large real-life computer-based systems by also using databases, spreadsheets and the World Wide Web.

STAGE 1 SF	Develop a three-year assessment plan using the Subject Assessment Guidelines for Information Technology. This should ensure the use of a variety of assessment forms relevant to the subject and progression across the three grades.
STAGE 2 WS	Use the Subject Assessment Guidelines for Information Technology to develop a grade-specific assessment plan. The forms of assessment listed must facilitate the achievement of the particular LOs and ASs in each grouping.
STAGE 3 LP	Indicate more classroom-specific assessment strategies, by mentioning the methods, forms and tools that will be used to assess learner performance in each activity. HINT: Not all activities need to be assessed – some may just be introductory in nature or for enrichment. The choice of an assessment strategy is determined by the LOs and ASs that have been grouped together for a particular Lesson Plan. The assessment strategy chosen must facilitate the achievement of these particular LOs and ASs in the classroom.

3.2.8 Inclusivity and Diversity

The following steps can be taken to effectively address diversity in the classroom when planning Information Technology teaching activities:

- consider individual past experiences, learning styles and preferences;
- develop questions and activities that are aimed at different levels of ability;
- provide opportunity for a variety of participation levels such as individual, pairs and small group activities;
- consider the value of individual methods ; and
- assess learners based on individual progress.

STAGE 1 SF	Teachers should be sensitive to inclusivity and diversity when identifying content, teaching styles and methods, forms of assessment and LTSM (Resources). Diversity should be accommodated in the following areas:
STAGE 2 WS	
STAGE 3 LP	This is catered for as EXPANDED OPPORTUNITIES in the Lesson Plan. Enrichment is provided for high achievers and remediation or other relevant opportunities for learners requiring additional support. It is not necessary to develop an activity to cater for each type of diversity which arises in the classroom. Teachers may find it possible to cater for different diversities within one activity with effective planning.

3.2.9 Learning and Teaching Methodology

STAGE 1 SF	It is not necessary to record Teaching Methods for either of these stages.
STAGE 2 WS	
STAGE 3 LP	This is catered for as the different phases in the Lesson Plan. It provides an indication of how teaching and learning will take place in each activity – i.e. how each activity will be presented in the classroom. Refer to Section 2.6 to see examples of teaching methods that are most suited to addressing the content and context of the Learning Outcomes and Assessment Standards in Information Technology.

3.3 DESIGNING A LEARNING PROGRAMME

A detailed description of the process involved in the design of a Learning Programme for Information Technology is provided in this section (see Sections 3.3.1 – 3.3.3). The process presented here is a suggestion of how to go about designing a Learning Programme.

3.3.1 Subject Framework (Grades 10-12) for Information Technology

Planning for the teaching of Information Technology in Grades 10 to 12 should begin with a detailed examination of the scope of the subject as set out in the Subject Statement. No particular format or template is recommended for this first phase of planning but the five steps below should be used as a checklist.

Although no prescribed document is required for this stage of planning, school-wide planning (timetables, ordering, teacher development, classroom allocation) as well as the development of grade-specific work schedules would benefit from short documents which spell out:

- The scope of the subject – the knowledge, skills and values; the content; the contexts or themes; electives etc. to be covered in the three grades
- A three-year assessment plan
- The list of LTSM required

1 Clarify the Learning Outcomes and Assessment Standards.

The essential question for Information Technology is: What Learning Outcomes do learners have to master by the end of Grade 12 and what Assessment Standards should they achieve to show that they are on their way to mastering these outcomes?

All learning, teaching and assessment opportunities must be designed down from what learners should know, do and produce by the end of Grade 12. The Learning Outcomes and Assessment Standards that learners should master by the end of Grade 12 are specified in the Information Technology Subject Statement.

2 Study the conceptual progression across the three grades.

Study the Assessment Standards for Information Technology across the three grades. Progression should be clearly evident across the grades.

3 Identify the content to be taught.

Analyse the Assessment Standards to identify the skills, knowledge and values to be addressed in each grade. Also consider the content and context in which they will be taught.

4 Identify three-year plan of assessment.

Use the Subject Assessment Guidelines to guide the three-year assessment plan. Consider what forms of assessment will be best suited to each of the Learning Outcomes and Assessment Standards. This ensures that assessment remains an integral part of the learning and teaching process in Information Technology and that learners participate in a range of assessment activities.

5 Identify possible LTSM (resources).

Consider which LTSM will be best suited to the learning, teaching and assessment of each Learning Outcome in the three grades using the Assessment Standards as guidance.

Refer to **Annexure A** for the content framework for Information Technology.

3.3.2 Designing Work Schedules for Information Technology

This is the second phase in the design of a Learning Programme. In this phase teachers develop Work Schedules for each grade. The Work Schedules are informed by the planning undertaken for the Subject Framework. The Work Schedules should be carefully prepared documents that reflect what teaching and assessment will take place in the 40 weeks of the school year. See Annexure B for examples of Work Schedules for Grades 10, 11 and 12.

The following steps provide guidelines on how to approach the design of a Work Schedule per grade for Information Technology:

1 Package the content.

Study the Learning Outcomes and Assessment Standards prescribed for the particular grade in Information Technology and group these according to natural and authentic links.

2 Sequence the content.

Determine the order in which the groupings of Learning Outcomes and Assessment Standards will be presented in the particular grade in Information Technology. Besides the conceptual progression in the Assessment Standards for Information Technology, context can also be used to sequence groupings in Information Technology.

3 Pace the content.

Determine how much time in the school year will be spent on each grouping of Learning Outcomes and Assessment Standards in the particular grade.

4 Review forms of assessment.

Revisit the forms of assessment listed for the particular grade in the Subject Assessment Guidelines, and refine them to address each grouping of Learning Outcomes and Assessment Standards as developed in Step 1.

5 Review LTSM.

Revisit the LTSM (resources) listed for the particular grade in the Subject Framework, and refine them to address each grouping of Learning Outcomes and Assessment Standards as developed in Step 1.

Refer to **Annexure B** for examples of work schedules for Grade 10, 11 and 12 for Information Technology.

3.3.3 Designing Lesson Plans for Information Technology

Each grade-specific Work Schedule for Information Technology must be divided into units of deliverable learning experiences, that is, Lesson Plans. A Lesson Plan adds to the level of detail in the Work Schedule. It also indicates other relevant issues to be considered when teaching and assessing Information Technology.

A Lesson Plan is not equivalent to a subject period in the school timetable. Its duration is dictated by how long it takes to complete the coherent series of activities contained in it.

1 Indicate the content, context, Learning Outcomes and Assessment Standards.

Copy this information from the Work Schedule for the particular grade.

2 Develop activities and select teaching method.

Decide how to teach the Learning Outcomes and Assessment Standards indicated in Step 1 and develop the activity or activities that will facilitate the development of the skills, knowledge and values in the particular grouping. Thereafter, determine the most suitable teaching method(s) for the activities and provide a description of how the learners will engage in each activity.

3 Consider diversity.

Explore the various options available within each activity that will allow expanded opportunities to those learners that require individual support. The support provided must ultimately guide learners to develop the skills, knowledge and values indicated in the grouping of Learning Outcomes and Assessment Standards.

4 Review assessment and LTSM (resources).

Indicate the details of the assessment strategy and LTSM to be used in each activity.

5 Allocate time.

Give an indication of how much time will be spent on each activity in the Lesson Plan.

3.3.4 Reflection and review of the Information Technology Learning Programme

After the Learning Programme has been delivered by means of Lesson Plans in the classroom, the teacher should reflect on what worked, how well it worked and what could be improved. Teachers need to note these while the experience is still fresh in their minds, so that if necessary, they can adapt and change the affected part of the Information Technology Learning Programme for future implementation. It is advisable to record this reflection on the Lesson Plan planning sheets.

Reflective planning cycle

Educators should make use of the reflective cycle in planning. The identification of learning needs usually precedes the learning that takes place. Monitoring and assessing the progress of learners allow for the identification of further areas to be developed as part of the learning.

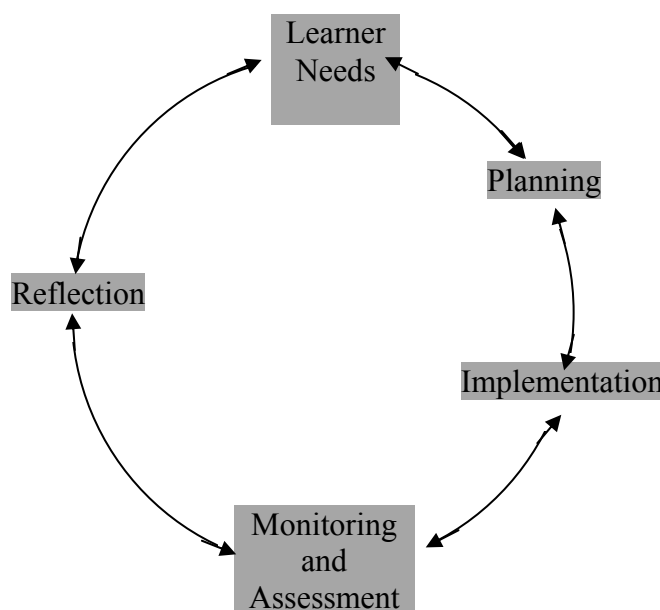


Figure 3.1

Because of the dynamic nature of the subject content, the teacher will continually need to review the content and the scenarios used in the class. New technologies and approaches appear on a regular basis and these need to be integrated into the Learning Programme.

ANNEXURE A

CONTENT FRAMEWORK FOR INFORMATION TECHNOLOGY

LO1 – LO3

	Grade 10	Grade 11	Grade 12
Introduction / Overview and basic concepts	<ul style="list-style-type: none"> • What is a computer? <ul style="list-style-type: none"> - General model of a computer in terms of input, storage, processing, output, communication • Data and information <ul style="list-style-type: none"> - Information processing cycle: Input, processing, output, storage - Transition from raw data to processed / organised information • Why we use computers? • Components of a computer system <ul style="list-style-type: none"> - Hardware (concepts) <ul style="list-style-type: none"> o Definition / description of hardware o Input devices o Output devices o Storage devices o System unit (processing – CPU and RAM) o Communication devices o Ports and connectors - Identify hardware components - Categorise hardware according to input, output, storage, processing and communication devices - Software (concepts) <ul style="list-style-type: none"> o Definition / description of software o Examples of software o Categories of software <ul style="list-style-type: none"> ▪ System software ▪ Application software o Identify software components o Shareware, freeware, open source, proprietary software, integrated software • Concept of interdependency of hardware and software • Types of computers such as 		

	<ul style="list-style-type: none"> - Desktop, notebooks, PDAs, server, mainframes, embedded computers (microcontrollers) - Compare input, processing, output, storage and communication devices of a desktop computer with a PDA. Which are the same? Which are different? - Convergence • Categorise computers <ul style="list-style-type: none"> - Portable (mobile) / Non-portable - Processing power - Usage 		
Hardware (System unit)	<ul style="list-style-type: none"> • Overview of motherboard and components <ul style="list-style-type: none"> - BIOS chip, chipsets, CPU, RAM, ROM, slots, cards, buses • Storage <ul style="list-style-type: none"> - Hard drives - CD/DVD drive and media - Flash drives • Storage vs Memory 	<ul style="list-style-type: none"> • Motherboard and components <ul style="list-style-type: none"> - Role of BIOS chip, chipsets, CPU, RAM, ROM, slots, cards, buses • Flow / transfer of data between components <ul style="list-style-type: none"> - Role of buses e.g. <ul style="list-style-type: none"> o System bus (Front-side bus) o External bus (AGP, PCI express) - Role of controllers (north bridge and south bridge) - Role of RAM (DRAM, SRAM) - Role of cache memory and caching • Expansion cards • Memory <ul style="list-style-type: none"> - ROM, CMOS, RAM,(DRAM, SRAM), Flash memory – role and characteristics - Temporary / permanent • Difference in performance of different components and caching (also web caching and disk caching) • Serial and parallel transmission • Modular design • IRQs • Components of the CPU: ALU, CU, FPU, registers, cache • Machine Cycle – Fetch, decode, execute 	<p>Factors affecting overall performance of computer system</p> <ul style="list-style-type: none"> • Factors such as: Memory, CPU, secondary storage, heat sink/fan, bus types/ design • Techniques to improve processor speed such as: pipelining, instruction sets, multi-core technologies, parallel processing (hyperthreading), caching • Role of virtual memory • Role of buffers and spoolers • Role of cache memory and caching • Communication – serial / parallel
Hardware should be dealt with at a non-technical level but which will enable the learner to troubleshoot at an elementary level or select the most appropriate hardware for a given scenario; whether to upgrade or buy new equipment; be aware of new trends and developments and how to integrate these with existing or new equipment; how technology can benefit the user in specific contexts			

System Software	<ul style="list-style-type: none"> • Operating system <ul style="list-style-type: none"> - General : Suite/Group of related programs which manages hardware and software - Specific : Provides User Interface, I/O management) - Overview of role of OS in terms of file, disk, memory, storage and process management - Types of operating systems (also associate with types of computers) e.g. stand-alone, network, embedded - Examples e.g. Windows, Linux • Role of utility software • Device Drivers 	Processing techniques such as <ul style="list-style-type: none"> • Multi-tasking, multi-threading, multi-processing Memory management <ul style="list-style-type: none"> • Virtual memory including concepts of paging and thrashing • Buffering and spooling 	Factors affecting overall performance of computer system <ul style="list-style-type: none"> • Software – throughput • See hardware section for techniques that involve both hardware and software
System software should be dealt with at a non-technical level but which will enable the learner to troubleshoot at an elementary level or to make better buying decisions; when to upgrade and when to buy new software; how technology can benefit a user in a specific scenario			
File management and organisation	<ul style="list-style-type: none"> • Organising files <ul style="list-style-type: none"> - Files, folders and drives - File Specification: Drive:Path/Filename/File Extension • File manager e.g. My Computer <ul style="list-style-type: none"> - Tree structure • Reasons for having a file structure • Manipulating files and folders • File-naming conventions • File types and extensions (association) such as exe, bat, com, txt, doc, xls, mdb, pdf • Saving as another type/version and exporting between file types 	File systems File types, properties, file attributes, system folders, dll files	
Computer management / Housekeeping	<ul style="list-style-type: none"> • Operating system utilities <ul style="list-style-type: none"> - Management of desktop - Management of files - General housekeeping tasks <ul style="list-style-type: none"> o Defrag o Backup o Scheduling / Updating o Archive o Compress / decompress files o Security features – firewall, anti-virus, control of spyware, addware o Installing/Uninstalling software (custom and full installation, product keys, 	<ul style="list-style-type: none"> • Threats to data integrity such as input errors (GIGO) hardware failure, malware such as viruses • Data protection including validation and verification procedures, anti-virus software, passwords, user rights, encryption, digital signatures, firewalls, filtering, privacy, protocols, UPS, backups, audit trails • Connect and install devices <ul style="list-style-type: none"> - Ports and connectors - USB, Firewire - Plug-n-Play, Hot swappable - Drivers 	

	<ul style="list-style-type: none"> activation codes) <ul style="list-style-type: none"> o Add devices / drivers • Management of system settings 		
Networks	<ul style="list-style-type: none"> • What is a network? • Advantages and disadvantages of networks • LANs: <ul style="list-style-type: none"> - Server- client, peer-to-peer - User access and access control and the role of networking software in this regard • Network administration • Internet and World Wide Web History, Timelines by notable events <ul style="list-style-type: none"> - ISPs - DNS, URL, Hypertext, HTTP, HTML, IP Addresses, Ports (internet), Browsers, Cookies, Plug-ins, Search Engines - Moral and ethical discussion on Internet use. 	<ul style="list-style-type: none"> • Why use networks? <ul style="list-style-type: none"> - Communication - Access to / sharing resources - Centralisation - File transfer - Productivity - Leisure • LAN, WAN, GAN WLAN and variations such as PAN, WLAN, VPN • Basic components such as: Computer, NIC, communication medium, switch, routers, operating system • Common types of cables / lines • Wireless technology • Ethernet Technology • Network topologies – star (reference to others) • Networking models such as client/server and peer-to-peer • Intranet and Extranet • Protocols such as <ul style="list-style-type: none"> - TCP/IP, Bluetooth, IrDA, WiFi / WiMAX, RFID, WAP, VoIP • Switching techniques <ul style="list-style-type: none"> - Packet, Line • Domains, URLs and IP-addresses • FTP 	
<p>Networks should be dealt with at a non-technical level but which will enable the learner to understand and to troubleshoot at an elementary level or to find the most workable ways to approach Internet problems; how technology can benefit specific scenarios; be aware of new trends and developments</p>			

e-Communications	<ul style="list-style-type: none"> • Connecting to the Internet – what is needed <ul style="list-style-type: none"> - ISP: choice, services such as hosts websites, e-mail, help desk, messaging, virus scanning, spam control - Types of lines: dial-up, leased lines, analogue, digital - Types of connection: telephone, ISDN, ADSL, wireless, satellite - Bundles: speed and bandwidth • Use of e-mail including <ul style="list-style-type: none"> - Attachments - Email signatures - Address books - Confirmation of delivery and receipt - Rules - Mailing lists - Web-based e-mail accounts • Resopnsible communication styles including <ul style="list-style-type: none"> - Netiquette - Spam - Hoaxes - Size of attachments - Phising • Navigate Internet 	<ul style="list-style-type: none"> • Nature and implications of electronic communications within groups (chat rooms, list-servers, newsgroups) • User groups • Discussion boards • Search engines <ul style="list-style-type: none"> - What is it? - Types - Techniques for searching such as wildcards, phrase searches, boolean searches, etc. • Transfer files over the Internet 	<ul style="list-style-type: none"> • Evaluate web pages and analyse information retrieved from the Internet <ul style="list-style-type: none"> - Authenticity of information (e.g who is the author?) - Validity of information – is it up-to-date? (e.g. date of publishment of statistics) - Validity of source (e.g. who provides the server for publishing the page? Who pays for the page? What is the purpose of the page?) - Verification e.g. cross-reference with other sources (Does the author cite his/her sources?) • Internet security issues such as <ul style="list-style-type: none"> - Spyware - Adware - Popups - Software ports - Identity theft - Firewalls - Keylogging • Protect information <ul style="list-style-type: none"> - Copyright - Intellectual property rights - Encryption - Passwords - User access rights and privileges - Digital signatures - Digital certificates - Security protocols such as SSL - Malware such as Spyware
The learner should be able to know what uses are most effective with regard to the Internet; how to protect a user against online threats; make good buying decisions; how technology can benefit specific scenarios; be aware of new trends and developments			
Social and ethical issues	<ul style="list-style-type: none"> • Economic reasons for using computers including <ul style="list-style-type: none"> - Saving paper, time, labour, communication costs - Efficiency, accuracy, reliability, affect on time and distance - Global communication - Ubiquity of devices connected to computers e.g. ATMs, phones • Effects of the use of computers in contexts such as <ul style="list-style-type: none"> - Home, small business, banking, shopping, 	<ul style="list-style-type: none"> • Effects of the use of computers <ul style="list-style-type: none"> - Home, small business, banking, shopping, manufacturing, advertising, education, agriculture, health services, communicaitons, • Careers such as <ul style="list-style-type: none"> - PC Technician, programmer, network administrator, graphics design, web-authoring, security consultants, systems analyst • Impact on workplace and employment practices such as 	<ul style="list-style-type: none"> • Effects of the use of computers <ul style="list-style-type: none"> - Home, small business, banking, shopping, manufacturing, advertising, education, agriculture, health services, communicaitons, new careers, entertainment, travel, security - Data mining – examples of applications such as sports, marketing, health, science • Ethical issues relating to the use of computers such as (cyberthreats and safeguards) <ul style="list-style-type: none"> - Copyright and intellectual property

	<p>manufacturing, advertising, education, agriculture, health services, communications, new careers</p> <ul style="list-style-type: none"> • Health and ergonomic issues including <ul style="list-style-type: none"> - Posture, eye strain, EMR issues, man-machine interactions • Environmental issues such as <ul style="list-style-type: none"> - Green computing, power consumption, toxic substances used in manufacturing of computers, e-waste, recycling • Computers providing solutions to issues of national and international importance such as <ul style="list-style-type: none"> - Global economies, universal access to information, digital divide • Responsible use, significance of computer developments 	<ul style="list-style-type: none"> - Mobile offices, virtual office, decentralisation of labour, office automation, robotics, artificial intelligence - Ability to balance the advantages and disadvantages of a computerised system • Impact of computers on globalising trends such as <ul style="list-style-type: none"> - E-commerce, e-learning - Video conferencing, interactive whiteboards, online banking, cellphone banking, social websites (e.g. facebook) • Computer and human error and the effects thereof such as <ul style="list-style-type: none"> - Accuracy and validity – data input - Data types used - Verification and validation of data - Software bugs - Hardware failure - Hardware configurations - System analysis and design - System development cycle • Computers providing solutions to issues of national and international importance such as <ul style="list-style-type: none"> - Statistics, weather, elections, census, simulations, HIV/AIDS 	<ul style="list-style-type: none"> - Security issues - Computer crimes such as hardware, software, information, identity, bandwidth theft, theft of time and services - Internet-related fraud scams - Internet attacks - Taking over PCs e.g. botnets, zombies - Right to access vs right to privacy - Misuse of personal information - Computer criminals - Network use policies and practices • Availability of information • Information overload • Capabilities and limitations of ICTs • Computers providing solutions to issues of national and international importance such as <ul style="list-style-type: none"> - Distributed computing power - Decision making - Safeguards against computer crimes, threats and criminals - Driving forces behind ICT inventions • Consequences of search engines and group communications such as <ul style="list-style-type: none"> - Social, political, environmental - Global community – cultural impact - Social websites - Social engineering - Wikis
	Be aware of what kinds of computer uses can advance specific careers; how technology impacts on the environment and society; how technology can benefit or harm the user		
	New technologies- impact and implications on all topics		
It should be noted that because of the conceptual progression of Assessment Standards across the three grades, content from Grade 10, Grade 11 and Grade 12 will be assessed at the end of Grade 12.			

LO4

A Generic content

Software development

	Grade 10	Grade 11	Grade 12
Spreadsheet	<p>Basic concepts in spreadsheets</p> <ul style="list-style-type: none"> • Concepts of data types • Create, manipulate and modify worksheets containing data • Organise data in rows and columns • Perform calculations using common functions and formulae <ul style="list-style-type: none"> - Date and time such as Date, day, now, today - Mathematical functions such as Sum, round, roundup, rounddown, sqrt, power, rand, sumif - Statistical functions such as average, min, max, count, counta, countblank, large, small, mode, median, countif - Logical functions - if - Text functions such as left, right, mid, len, value, text, find • Effect of rounding and truncation • Create and edit charts • Format, edit, print and save workbooks and worksheets • Absolute and relative cell reference • Import / Export data 	<ul style="list-style-type: none"> • Perform calculations using more advanced functions and formulae <ul style="list-style-type: none"> - Mathematical functions - Statistical functions - Logical functions • Use of boolean operators (and, or, not) • Create and edit charts to depict data in graphical form • Integrate spreadsheet and database applications • Import / Export data 	<ul style="list-style-type: none"> • Perform calculations using more advanced functions and formulae • What if? Scenarios • Integrate spreadsheet and database applications • Import / Export data
Database	<ul style="list-style-type: none"> • Create database using single tables • Objects <ul style="list-style-type: none"> - Tables, Queries, Reports • Create fields in a table <ul style="list-style-type: none"> - Names (choose relevant names) - Data types – fields such as text, number, date and time, currency, autonumber, Yes/No, memo, , lookup - Properties such as Size / length, Input mask, Default value, Validation rule, Validation text, Required, Text alignment, Decimal places - Choose suitable Primary key 	<ul style="list-style-type: none"> • Create database using multi-tables • Set up relationships between tables <ul style="list-style-type: none"> - 1:M e.g. register class → pupils - Two tables showing master detail relationship with at least one foreign key in one table • Queries from two tables with multiple criteria • Concept of referential integrity • SQL using two tables <ul style="list-style-type: none"> - SELECT, DISTINCT - WHERE - ORDER BY 	<p>As in Grade 11 in more complex contexts using more complex algorithms:</p> <ul style="list-style-type: none"> • Create database using multi-tables • Set up relationships between tables <ul style="list-style-type: none"> - 1:M e.g. register class → pupils - Two tables showing master detail relationship with at least one foreign key in one table • Data redundancy and Normalisation by inspection <p>SQL</p> <ul style="list-style-type: none"> • Display records from a table in a sorted order

	<ul style="list-style-type: none"> Table manipulator <ul style="list-style-type: none"> Sort record Change field content Queries <ul style="list-style-type: none"> Create basic queries using SQL <ul style="list-style-type: none"> SELECT; FROM; WHERE Boolean operators (and, or, not) Mathematical operators Reports <ul style="list-style-type: none"> Create reports using a Wizard Basic editing of reports such as change the heading and add page headers Display grouped data Display summary calculations in groups and at end of report (sum, avg, max, min) Import, Export data 	<ul style="list-style-type: none"> GROUP BY Creating calculated fields Formatting with round, int, etc. Create a join query (single joins) using 'WHERE' Mathematical operators Special operators: BETWEEN, IN, LIKE Aggregate function SUM, AVERAGE, MIN, MAX, COUNT Date functions 	<ul style="list-style-type: none"> Group related data together Creating calculated fields Formatting with round, int, etc. Create a join query (single joins) using 'WHERE' Mathematical operators Special operators: BETWEEN, IN, LIKE Aggregate function SUM, AVERAGE, MIN, MAX, COUNT Date functions <p>The following knowledge and skills are new to Grade 12</p> <ul style="list-style-type: none"> Delete records meeting specified criteria from a table Add data to a database Update the content of certain fields in a table (Update and set)
Programming			
Data structures	<ul style="list-style-type: none"> Concept of the way of storing data in a computer so that it can be used efficiently for references to and operations on them Variables Simple data types Converting data types and the effects thereof 	<ul style="list-style-type: none"> Scope of variables Data structures <ul style="list-style-type: none"> Arrays (1 D) Classes and objects Database – 2 tables 	<ul style="list-style-type: none"> Scope of variables Data structures <ul style="list-style-type: none"> Arrays (2 D) Classes and objects Array of objects Text files Database – 2 tables
Control structures	<p>Control structures</p> <ul style="list-style-type: none"> Sequential Selection <ul style="list-style-type: none"> Single, double and multiple selection Repetition <ul style="list-style-type: none"> Counting Conditional 	<p>Control structures</p> <ul style="list-style-type: none"> Sequential Selection – nested statements Repetition – nested statements <ul style="list-style-type: none"> Conditional including using a sentinel value (flag) 	Control structures as in Grade 10 and 11
Operations	<ul style="list-style-type: none"> Mathematical operations using mathematical operators – sequence / brackets Integer arithmetic (dividend and remainder – modulo) Relational operators Boolean operators Simple string manipulation <ul style="list-style-type: none"> Length Position of a character in a string Obtain a substring from a string 	<ul style="list-style-type: none"> String manipulation <ul style="list-style-type: none"> Building strings Obtain a substring from a string Replace characters in a string (insert and delete) Operations on and manipulation of 1D arrays <ul style="list-style-type: none"> Basic I/O manipulation Simple sort Sequential search using a sentinel value (flag) Simple calculations such as calculating average, sum 	<ul style="list-style-type: none"> Operations on 2 D arrays <ul style="list-style-type: none"> Simple operations such as row and column totals Operations on and manipulation of array of objects. <ul style="list-style-type: none"> Tracking the number of elements in an array Inserting elements Deleting elements Sorting Processing: sum, average Create, use, modify classes and objects

	<ul style="list-style-type: none"> - Delete / Insert characters / substrings - Concatenation of strings - Changing case • Validation of input <ul style="list-style-type: none"> - Valid integer or real number - Data within correct range (e.g. Grade \geq 10 AND Grade \leq 12) 	<ul style="list-style-type: none"> • Classes and objects <ul style="list-style-type: none"> - Class declaration – attributes and methods - Create object - Instantiation - Encapsulation - Constructor methods - Accessor and mutator methods 	<ul style="list-style-type: none"> - As in Grade 11 - Inheritance - Polymorphism (conceptual level) • Text files: <ul style="list-style-type: none"> - Linking to a text file - Open, Close - Loop through text file - Import data from text file - Export data to text file • String manipulation <ul style="list-style-type: none"> - As in Grade 10 and 11 - Using CSV in text files for inputting data
Functions / procedures / methods	<ul style="list-style-type: none"> • Mathematical functions / procedures / methods <ul style="list-style-type: none"> - Minimum and maximum values, power, square roots, rounding, random values, absolute values, truncation • Simple user defined functions / procedures / methods using parameters (not var parameters) 	<ul style="list-style-type: none"> • User defined functions / procedures / methods using parameters as part of class including reference parameters 	<ul style="list-style-type: none"> • User defined functions / procedures / methods using parameters as part of class including reference parameters
Database and programming		<p>Access and manipulate database through programming language</p> <ul style="list-style-type: none"> • Setup ODBC/JDBC/ADO connection or connect to database by providing path in Java/Delphi statements • Select and update data and records using basic SQL statements within programming language 	<p>Access database through programming language</p> <ul style="list-style-type: none"> • Setup ODBC/JDBC/ADO connection or connect to database by providing path in Java/Delphi statements • Select and update data and records using basic SQL statements within programming language
Error handling	<ul style="list-style-type: none"> • Syntax • Runtime • Logic • Valid input as indicated in Operations section 	<ul style="list-style-type: none"> • Protection blocks <ul style="list-style-type: none"> - Try and catch - Exception handling 	<ul style="list-style-type: none"> • Protection blocks <ul style="list-style-type: none"> - Try and catch - Exception handling
Debugging	<ul style="list-style-type: none"> • Trace tables • Use debugger facilities such as watches, traces, breakpoints 	<ul style="list-style-type: none"> • Trace tables • Use debugger facilities such as watches, traces, breakpoints 	<ul style="list-style-type: none"> • Trace tables • Use debugger facilities such as watches, traces, breakpoints
Testing	<ul style="list-style-type: none"> • Testing for correct output with valid / normal data • Testing for error handling with extreme and erroneous data and invalid responses 	<ul style="list-style-type: none"> • Testing for correct output with valid / normal data • Testing for error handling with extreme and erroneous data and invalid responses 	<ul style="list-style-type: none"> • Testing for correct output with valid / normal data • Testing for error handling with extreme and erroneous data and invalid responses
Documentation	<ul style="list-style-type: none"> • Comments • Analysis and Design documents (planning interface, Input-Processing-Output tables / flowcharts) • User guide 	<ul style="list-style-type: none"> • Comments • Analysis and Design documents (planning interface, Input-Processing-Output tables / flowcharts) • User guide • Programmer guide (technical guide) 	<ul style="list-style-type: none"> • Comments • Analysis and Design documents (planning interface, Input-Processing-Output tables / flowcharts, ERD – database) • User guide • Programmer guide (technical guide)

User interface	<ul style="list-style-type: none"> • Good and bad user interfaces – basic HCI concepts • Appearance • Order • Input - Messages • Organisation of output • Simplicity and clarity 	<ul style="list-style-type: none"> • Error messages (the error message returned should indicate a solution) • Exception handler • Data validation techniques <p>GUI</p> <ul style="list-style-type: none"> • Appropriate components for input and output • Use of properties with components e.g. tooltips 	<ul style="list-style-type: none"> • Navigation between screens • Menus / Page controls • Buttons • Context sensitive help - Projects • Short cuts • Metaphors or images • Consistent behaviour (e.g. F1 for Help) • GUI as a front end to an object class where all processing takes place in the object class(es). E.g. an object class, an array of objects class and a front end GUI that instantiates an object of the array of objects.
GUI components	Such as buttons, textfields / areas, labels, panes, checkboxes, radiobuttons, lists, grids, pagecontrol, message dialogue Database:OnPost, OnError, OnBeforeEdit, AfterScroll, etc.		
Events and event handlers	Such as click, mousemove, activate, close, exit, show, create, change, keypress,		

Please note: Where Grade 11 and 12 content overlaps, it is suggested that basic concepts are introduced in Grade 11 and that there should be conceptual progression towards Grade 12. In Grade 12 the complexity of the context in which these topics / content is addressed will be of a higher level than in Grade 11.

B Programming Language -specific content

How to achieve the programming outcomes in Delphi and Java (This section should be read in conjunction with Section A)

Topic	Delphi		Java	
	Content	Comment	Content	Comment
Grade 10				
General / Introduction Programming environment	GUI Event Handlers Events such as OnClick, OnClose, OnShow, OnMouseMove Components: Edit, Checkbox, Radio Group, Label, Panel, Listbox, RichEdit, Memo, BitButton Form class	Central to teaching Delphi	Use of existing classes to instantiate objects and calling methods from such objects Exposure to API in doing the above	Central to teaching Java and building up of object oriented programming style
Data Types and variables	Integer, Real, Character String, Boolean Scope of variables	Declare 'non-local' variables in private section of Form class	Int, double, char, String and boolean Scope of variables	This should be taught together with operations for each type Scope of variables inside selection and repetition structure
Input	InputBox	Introduce components as progressing with programming code and concepts so that learners are able to choose most appropriate components for specific tasks / events	Scanner class / JOptionPane class	
Output	Input and output components and properties: Edit, Checkbox, Radio Group, Label, Panel, Listbox, RichEdit, Memo Formatting output in RichEdit using tabs and newline / return characters		System.out.println and/or JOptionPane class for output Formatting of numbers using DecimalFormat class and/or formatting output using printf function and the use of %, %d, %f, %s format specifiers (JDK 1.6) Escape sequence: \n, \t, \r, \\. \", \f	
Operators & Operations	Mathematical: +, -, *, / Div, mod Relational: <, >, =, <>, <=, >= Boolean: AND, OR, NOT Precedence and brackets Simple string manipulator: Length, Pos, Concat (+), Uppercase, Copy, Delete, Insert, Val	Includes data type conversion such as IntToStr, StrToInt, StrToFloat, StrToIntDef, FloatToString, FloatToStrF, to be able to do mathematical and string manipulations	Mathematical: +, -, *, / Modulus an integer arithmetic % / Relational: <, >, ==, !=, <=, >=, equals Boolean: &&, , ! Precedence and brackets String: + (concat) Simple string manipulation Length, charAt, IndexOf, toUpperCase, toLowerCase, substring, toString	Includes type conversion between basic types (casting and use of Integer.parseInt and Double.parseDouble)

Control structures	Sequential Selection <ul style="list-style-type: none"> - Single selection IF ... then - Double selection IF ... then ... else - Multiple selection Case Repetition <ul style="list-style-type: none"> - Counting For ... do - Conditional While ... do - Repeat ... until 		Sequential Selection <ul style="list-style-type: none"> - Single selection if - Binary/Double selection if ... else - Multiple selection switch Repetition <ul style="list-style-type: none"> - Counting for ... - Conditional while ... - do ... while 	
Classes and objects	Form Class	Methods with Form class Declare 'non-local' variables in private section	Class with main method	Non-static (instance) methods should be seen as mechanisms to change the attributes of an object. They should not be taught in isolation
Methods (functions and procedures)	Mathematical such as sqr, sqrt, round, trunc, abs, random, power, min, max, frac, int, odd, dec, inc, etc Modules <ul style="list-style-type: none"> - Introduce simple user defined functions and procedures using parameter passing e.g. CalcInterest(12) if 12% interest should be added, GetMonthName(6) to determine the name of month number 6. (not reference parameters) Call functions and procedures	Methods should be seen as mechanisms to change the attributes of an object. They should not be taught in isolation Functions and procedures using a unit as a container	Use of static methods from Math class or given class. For Math class: sqrt, pow, round, min, max, random, etc Modules <ul style="list-style-type: none"> - Use of typed and void methods of an object (with help of API) - Creating a class 	
GUI	IDE – Delphi		GUI in applications such as Access	Introduce concepts of components, events, etc.
Defensive programming	Meaningfull error messages to user e.g. message dialogue boxes Error checking techniques <ul style="list-style-type: none"> - Check that data has been entered / compulsory fields - Check that the right type of data has been entered e.g. Real or Integer using VAL-procedure - Check that data is valid (falls between a certain range) - Use the MaskEdit to ensure valid data (for use in projects only) 		Meaningfull error messages to user Error checking techniques <ul style="list-style-type: none"> - Check that data has been entered / compulsory fields - Check that data is valid (falls between a certain range) 	

Algorithms / problem solving and fundamental programming concepts	Swop two values Determine smallest, largest value of more than two values Isolate digits in an integer value Determine whether a number is a prime number, even, odd number Determine whether a number is a factor of another number	Though functions such as prime, odd, can be used, learners should be able to write the solutions themselves and apply the algorithms.	Swop two values Determine smallest, largest value of more than two values Isolate digits in an integer value Determine whether a number is a prime number, even, odd number Determine whether a number is a factor of another number	Though methods from Math class can be used, learners should be able to write the solutions themselves and apply the algorithms.
Grade 11				
Data structures	Database with two tables 1 D arrays Classes and Objects	Populate data structures using InputBox or Random (for quick testing of algorithms) or input components or use LoadFromFile method	Database with two tables 1 D arrays Classes and Objects	
Control structures	Sequential Selection (nested) Repetition (nested) - Conditional While ... do - Repeat ... until Including sentinel value (flag)	Use nested loop to display data in StringList / Grid component	Sequential Selection (nested) Repetition (nested) - Conditional while ... - do ... while Including sentinel value (flag)	Use nested loop to display data in console rows and columns / StringList / Grid component
1-D Arrays	- Declare - Basic I/O manipulation - Simple sort using a method in a class - Sequential search (including use of sentinel value) using a method in a class - Simple calculations such as calculating average, sum using methods in a class	Use arrays as attributes in a class if appropriate	- Declare - Basic I/O manipulation - Simple sort using static method in a class - Sequential search (including use of sentinel value) using static method in a class - Simple calculations such as calculating average, sum using methods in a class	Use arrays as attributes in a class if appropriate
Database and programming	<ul style="list-style-type: none"> • Setup ADO connection • Use tables in database and manipulate records and fields through Delphi code using SQL statements • Find a specific record in a table using Locate 	See generic section for SQL statements	<ul style="list-style-type: none"> • Setup ODBC/JDBC/ADO connection or connect to database by providing path in Java statements • Use tables in database and manipulate records and fields through Java code using SQL statements • Find a specific record in a table using Locate 	See generic section for SQL statements
Classes and objects	<ul style="list-style-type: none"> • Creation of classes and class design • Coding methods (including 	Place each class in own unit	<ul style="list-style-type: none"> • Creation of classes and class design • Coding methods (including 	

	constructors, get/set, toString) to perform calculations or manipulate the attributes of an object.		constructors, get/set, toString) to perform calculations or manipulate the attributes of an object.	
GUI	Delphi IDE Events and event handlers Components as specified in Grade 10 as well as PageControl with pages, DBGrid	See generic section	Netbeans / Turbo JBuilder Basic events and event handlers Components	See generic section
Defensive programming	Try...Except Try...Finally Data validation, e.g. checking for presence, range, uniqueness, length, type and check-digit. Return meaningful error messages		Try / catch / finally Throws exception Data validation, e.g. checking for presence, range, uniqueness, length, type and check-digit. Return meaningful error messages	
Operations	String manipulation: All methods used in Grade 10 as well as Insert, Delete,	See generic section	String manipulation: All methods used in Grade 10 as well as deleting and inserting characters (delete, StringTokenizer, split)	See generic section
Algorithms / problem solving	Data validation	Determine valid ID, valid cell phone, valid gender etc. using the methods of the class to which the data belong	Data validation	Determine valid ID, valid cell phone, valid gender etc. using the methods of the class to which the data belong
Grade 12				
Data structures	Text files Arrays – 2D Classes and Objects Database – at least 2 tables Array of objects (1 D)		Text files Arrays – 2D Classes and Objects Database – at least 2 tables Array of objects (1 D)	
Database and programming	<ul style="list-style-type: none"> Setup ADO connection Use tables in database and manipulate records and fields through Delphi code using SQL statements 	<p>Batch populating and editing of a database using a text file.</p> <p>See generic section for SQL statements</p>	<ul style="list-style-type: none"> Setup ODBC/JDBC/ADO connection or connect to database by providing path in Java/Delphi statements Use tables in database and manipulate records and fields through Java code using SQL statements 	<p>Batch populating and editing of a database using a text file.</p> <p>See generic section for SQL statements</p>
Classes and objects	<ul style="list-style-type: none"> Create arrays of objects Create classes using inheritance. (for implementation in 2009) Create arrays of objects of parent and inherited classes (for implementation in 2009) 	Ensure correct use of private, protected and public sections	<ul style="list-style-type: none"> Create arrays of objects Create classes using inheritance. (for implementation in 2009) Create arrays of objects of parent and inherited classes (for implementation in 2009) 	Ensure correct use of private, protected and public sections

GUI Events and event handlers	Delphi IDE Events and event handlers Components OnExit events to be used with error control	See generic section	Netbeans / Turbo JBuilder Events and event handlers Components (extending JFrame to create GUI)	See generic section
Operations	Text files: <ul style="list-style-type: none"> • AssignFile • Reset / Rewrite • Readln / Write / Writeln • CloseFile • While not Eof • Import data from text file • Export data to text file String manipulation <ul style="list-style-type: none"> • See generic section 2D arrays <ul style="list-style-type: none"> • Simple processing e.g. row and column totals Array of object manipulation <ul style="list-style-type: none"> • See generic section 		Text files: <ul style="list-style-type: none"> • File, FileReader, FileWriter, BufferedReader, BufferedWriter • readLine, write • while (line!=null) • close String manipulation <ul style="list-style-type: none"> • See generic section 2D arrays <ul style="list-style-type: none"> • Simple processing e.g. row and column totals Array of object manipulation <ul style="list-style-type: none"> • See generic section 	
Algorithms and problem solving	Data validation and defensive programming using components, programming techniques specified in Grades 10 and 11 as well as code in OnExit events. Desgin own algorithms to solve problems		Data validation and defensive programming using components, programming techniques specified in Grades 10 and 11 as well as finally clause. Desgin own algorithms to solve problems	

ANNEXURE B

EXAMPLES OF WORK SCHEDULES FOR INFORMATION TECHNOLOGY

Example of a Grade 10 Work Schedule

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
A computer used in a SOHO environment				
Term 1				
1 week (= 4 hours)	10.1.1 10.1.2 10.1.3 10.1.10 10.3.1	<i>Introduction to hardware and software</i> <ul style="list-style-type: none"> • Concepts of hardware • Concepts of software <ul style="list-style-type: none"> ○ System software vs application software • Computer types • Hardware components of a typical computer • Software for a typical computer • Reasons for using computers 	Daily: Assignments Q&A sessions	Textbook Computer components
½ week	10.1.12 10.1.13	<i>Introducing the desktop</i> <ul style="list-style-type: none"> • File organisation • Types of files 	Daily: Assignments	Textbook Operating system
½ week	10.4.4	<i>Introducing GUIs</i> <ul style="list-style-type: none"> • Design aspects • Components 	Daily: Debate Assignments	Textbook GUIs
½ week	10.4.4 10.4.5	<i>UI</i> <ul style="list-style-type: none"> • Design user interface 	Daily: Assignments	Textbook Programming Language / Application software
1 week	10.4.1 10.4.11	<i>Problem-solving</i> <ul style="list-style-type: none"> • Core concepts and skills • Simple algorithms - IPO • Data types 	Daily: Investigate Debate Assignments	Textbook
1 week	10.1.3 10.3.7 10.1.10 10.1.11 10.3.11	<i>Buying a computer for the SOHO</i> <ul style="list-style-type: none"> • Hardware to buy <ul style="list-style-type: none"> ○ Computer components ○ I/O devices ○ Storage • Health and Ergonomic issues • System software – Operating system <ul style="list-style-type: none"> ○ Proprietary vs Open-Source • Legal implications 	Daily: Investigate Debate Assignments	Textbook Brochures
1 week	10.4.2 10.4.3 10.1.12	<i>Budget for buying computer and comparing options</i> <ul style="list-style-type: none"> • Spreadsheet programme • File organisation 	Daily: Assignments	Textbook Brochures
3 weeks	10.4.1	<i>Introduction to programming</i> <ul style="list-style-type: none"> • Core concepts 	Daily: Assignments	Textbook
½ week	10.1.1 10.1.3 10.1.5 10.2.1	<i>Communicating with the outside world</i> <ul style="list-style-type: none"> • E-communication – getting connected <ul style="list-style-type: none"> ○ Investigate connection options, browser and mailing software ○ Role of ISP • Responsible communication styles 	Daily: Investigate Debate Assignments PoA: Test Hardware, Software, etc.	Textbook Brochures

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
1 week	10.4.17 10.4.6	<i>Business contacts using a database</i> <ul style="list-style-type: none"> Learn to use a database in 10 steps Develop a single-table database 	Daily: Assignments PoA: Practical task Database	Textbook
1 week	10.4.2 10.4.3 10.4.13	<i>Investigate and compare connection options, ISPs regarding costs</i> <ul style="list-style-type: none"> Spreadsheet programme Rounding and truncation 	Daily: Assignments	Textbook
Term 2				
½ week	10.4.7 10.4.17	<i>Boolean conditions, operators and expressions</i> <ul style="list-style-type: none"> Diagrams and core concepts Database – queries 	Daily: Assignments	Textbook
½ week	10.4.8 10.4.2	<i>Decision-making process</i> <ul style="list-style-type: none"> Diagrams and core concepts Spreadsheet – If function, etc 	Daily: Assignments	Textbook
1 week	10.2.2 10.2.4 10.2.5	<i>Communicating with the outside world</i> <ul style="list-style-type: none"> Use E-mail Use Internet Apply responsible communication styles 	Daily: Assignments	Textbook Internet Email
2½ weeks	10.4.10 10.4.13	<i>Programming</i> <ul style="list-style-type: none"> Mathematical functions Rounding and truncation 	Daily: Assignments	Textbook
½ week	10.3.9 10.3.11 10.2.4	<i>Social impact of e-communication and ethical issues</i> <ul style="list-style-type: none"> Computer crime Viruses Spam, phishing, etc. 	Daily: Assignments Debate PoA: Assignment Social and ethical issues – Internet	Textbook Internet
3 weeks	10.4.12	<i>Programming</i> <ul style="list-style-type: none"> Selection 	Daily: Assignments	
2 weeks			PoA: Exam	SAG
Term 3				
3 weeks	10.4.8 10.4.12	<i>Programming</i> <ul style="list-style-type: none"> Looping 	Daily: Assignments	Textbook
1½ week	10.4.11	<i>Programming</i> <ul style="list-style-type: none"> Character handling - basic Basic text functions and procedures 	Daily: Assignments	Textbook
2 weeks	10.4.1 10.4.5 10.4.7 10.4.8 10.4.10 10.4.11 10.4.12	<i>Programming</i> <ul style="list-style-type: none"> User defined methods Solutions for scenarios 	Daily: Assignments PoA: Assignment Programming PoA: PAT Programming project - start	Textbook
½ week	10.1.14 10.1.15	<i>Operating system – Manage & Organise</i> <ul style="list-style-type: none"> Tools and utilities Install and Uninstall 	Daily: Assignments Demonstration	Textbook
1 week	10.4.17 10.4.6	<i>Database</i> <ul style="list-style-type: none"> SQL (see content framework) 	Daily: Assignments	Textbook

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
½ week	10.3.2 10.3.9 10.3.11	<i>Use of computers</i> <ul style="list-style-type: none"> • Application areas • National and International issues • New developments 	Daily: Assignments Investigation	Textbook Internet
½ week	10.4.21 10.4.22	<i>Help files</i> <ul style="list-style-type: none"> • Application packages 	Daily: Assignments Investigation	Textbook
½ week	10.4.14	<i>Testing software - suggestions</i>	Daily PoA: Test Spreadsheet	Textbook
½ week	10.3.8	<i>Impact on environment</i> <ul style="list-style-type: none"> • E-waste • Green computing 	Daily: Assignments Investigation	Textbook Internet
1 week	10.1.5	<i>Networks</i> <ul style="list-style-type: none"> • Basic concepts • User Access 	Daily: Assignments Demonstrations	Textbook
Term 4				
1 week			PoA: PAT Finalise projects	
2 weeks	10.4.1 10.4.5 10.4.7 10.4.8 10.4.10 10.4.11 10.4.12	<i>Programming</i> <ul style="list-style-type: none"> • Solutions for scenarios • Problem-solving 	Daily: Assignments	Textbook
1 week	LO1 LO2 LO3	<i>Revision, consolidation and extension</i> <ul style="list-style-type: none"> • Hardware and software • E-communication • Social and ethical issues 	Daily: Assignments	Textbook Worksheets Previous tests, exams
2 weeks	LO4	<i>Revision, consolidation and extension</i> <ul style="list-style-type: none"> • Programming 	Daily: Assignments	Textbook Worksheets Previous tests, exams
2 weeks	ALL		PoA: Exam	SAG

Grade 11:

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
Expanding - SOHO environment				
Term 1				
½ week (=2 hours)	11.2.2 11.2.9 11.1.17	<i>Group communications</i> <ul style="list-style-type: none"> • E-communication - groups <ul style="list-style-type: none"> ○ Types, definitions and concepts ○ Working ○ Implications 	Daily: Assignments Debate	Textbook Operating system
½ week	11.2.5 11.2.9 11.4.7	<i>An information-driven society</i> <ul style="list-style-type: none"> • WWW and search engines • Advanced search techniques • Boolean conditions 	Daily: Assignments	Textbook
½ week	11.2.3 11.2.5 11.2.9 11.4.7	<i>An information-driven society: Finding information</i> <ul style="list-style-type: none"> • Use search engines • Apply advanced search techniques using boolean conditions • Posting questions to discussion groups 	Daily: Assignments	Textbook Internet
½ week	11.4.8 11.4.9	<i>Programming</i> <ul style="list-style-type: none"> • Revise selection structures – selection by condition and selection by key • Revise loops – conditional and unconditional / counting – nested structures 	Daily: Assignments	Textbook
½ week	11.3.6 11.4.4 11.4.5 11.4.6 11.4.16	<i>GUI</i> <ul style="list-style-type: none"> • Error messages – application software • Error messages – programming language • Data validation • Exception handler 	Daily: Assignments	Textbook Programming Language / Application software
1½ week	11.4.11	<i>Programming</i> <ul style="list-style-type: none"> • Data structures – group data • Strings 	Daily: Assignments	Textbook
1 week	11.4.2 11.4.3 11.4.7	<i>Spreadsheets</i> <ul style="list-style-type: none"> • Advanced features and functions – introduction • Graphs 	Daily: Assignments	Textbook
1 week	11.1.3 11.1.17	<i>Understanding computers</i> <ul style="list-style-type: none"> • Motherboard and components • Interaction of computer components • Modular design • Data flow between components • Difference in performance of different components • Caching 	Daily: Assignments Demonstraion Q&A sessions	Textbook Computer components
2 weeks	11.4.11	<i>Programming</i> <ul style="list-style-type: none"> • Data structures – group data • Arrays – 1 D 	Daily: Assignments	Textbook
1 week	11.1.5 11.1.6 11.1.17	<i>Expanding the office – networking – introduction</i> <ul style="list-style-type: none"> • Connecting computers and devices • Server-based vs peer-to-peer • Topologies • PANs, LANs, WANs • Devices • Software • Cabling / wireless technology 	Daily: Assignments Demonstraion Q&A sessions	Textbook Components

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
		<ul style="list-style-type: none"> New developments and trends 		
1½ week	11.4.11	<i>Programming</i> <ul style="list-style-type: none"> Data structures – group data Classes and Objects – introduction and basics 	Daily: Assignments PoA: Practical assignment- programming	Textbook SAG
½ week	11.1.5 11.1.6 11.1.17	<i>Expanding the office – networking</i> <ul style="list-style-type: none"> Architectures Protocols Server types Switching techniques Advantages / Disadvantages 	Daily: Assignments Demonstraion Q&A sessions PoA: Test Networks	Textbook Components SAG
Term 2				
2 weeks	11.4.11 11.4.12	<i>Programming</i> <ul style="list-style-type: none"> Data structures Classes and Objects 	Daily: Assignments	Textbook
½ week	11.1.3 11.1.4 11.1.17	<i>Expanding the office</i> <ul style="list-style-type: none"> Add devices and install drivers Plug-n-Play, USB, Firewire 	Daily: Assignments	Textbook PCs, Devices
½ week	11.1.4 11.1.17	<i>Expanding the office</i> <ul style="list-style-type: none"> Practically install devices and drivers Troubleshoot and test devices 	Daily: Assignments PoA – Practical Task Spreadsheet	Textbook PCs, Devices Drivers SAG
1 week	11.1.3 11.1.11 11.1.17	<i>Understanding computers</i> <ul style="list-style-type: none"> Processing techniques such as multi-tasking, multi-threading Memory management 	Daily: Assignments	Textbook
½ week	11.3.6 11.4.13 11.4.14 11.4.15 11.4.16	<i>Error free computing</i> <ul style="list-style-type: none"> Overflow / truncation Trace tables Test data Data validation 	Daily: Assignments	Textbook
3 weeks	11.4.11 11.4.13 11.4.14 11.4.15 11.4.16	<i>Programming</i> <ul style="list-style-type: none"> Structures and repetitive data Selection, loops Arrays Classes and Objects 	Daily: Assignments	Textbook
½ week	11.1.13	<i>Operating system</i> <ul style="list-style-type: none"> Files and directories – names, types System folders Properties, attributes 	Daily: Assignments	Textbook Operating system
2 weeks			PoA: Exam	SAG

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
Term 3				
1 week	11.4.7 11.4.13 11.4.16 11.4.17	<i>Database</i> <ul style="list-style-type: none"> Multiple tables Queries including SQL Validation 	Daily: Assignments	Textbook
1 week	11.4.7 11.4.11 11.4.13 11.4.14 11.4.15 11.4.16 11.4.17	<i>Programming</i> <ul style="list-style-type: none"> Classes and objects Database and programming language – connectivity – introduction 	Daily: Assignments	Textbook SAG
½ week	11.3.2 11.3.3 11.3.4 11.3.11	<i>The workplace</i> <ul style="list-style-type: none"> Availability of information Computers in various sectors Careers that utilise computers Impact of computers on workplace and employment practices 	Daily: Assignments PoA: PAT Presentation – impact of computers in workplace	Textbook SAG
3 weeks	11.4.7 11.4.11 11.4.13 11.4.14 11.4.15 11.4.16 11.4.17	<i>Programming</i> <ul style="list-style-type: none"> Classes and objects Database and programming language – connectivity Manipulate data through programming language 	Daily: Assignments PoA: PAT Programming project – start	Textbook SAG
½ week	11.2.7 11.2.9 11.3.5 11.3.9 11.3.11	<i>The global world</i> <ul style="list-style-type: none"> Impact of computers in globalising trends such as e-commerce, e-learning Using computers in providing solutions to issues of national and international importance New developments and trends 	Daily: Assignments Investigation Case studies	Textbook Internet
½ week	11.1.15 11.1.17 11.3.6 11.3.11 11.4.16	<i>Error free computing</i> <ul style="list-style-type: none"> Computer error Human error Validation and verification Bugs System analysis and development Data protection and security 	Daily: Assignments Case studies	Textbook Internet
2 weeks	11.4.11 11.4.13 11.4.14 11.4.15 11.4.16 11.4.17	<i>Programming</i> <ul style="list-style-type: none"> Selection, loops Strings Arrays Classes and objects Database connectivity 	Daily: Assignments	Textbook
2 weeks	11.4.7 11.4.11 11.4.13 11.4.14 11.4.15 11.4.16 11.4.17	<i>Programming and software development</i> <ul style="list-style-type: none"> Solutions for scenarios Problem-solving 	Daily: Assignments PoA: Practical Test Programming and database	Textbook

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
½ week	11.4.21	<i>Programming documentation</i> <ul style="list-style-type: none"> User's guide 	Daily: Assignments Demonstrations	Textbook
Term 4				
1 week	LO4	Programming project - finalise	PoA: PAT Finalise project	SAG
2 weeks	11.4.11 11.4.13 11.4.14 11.4.15 11.4.16 11.4.17	<i>Programming</i> <ul style="list-style-type: none"> Solutions for scenarios Problem-solving 	Daily: Assignments	Textbook
1 week	LO1 LO2 LO3	<i>Revision, consolodation and extension</i> <ul style="list-style-type: none"> Hardware and software E-communication Social and ethical issues 	Daily: Assignments	Textbook Worksheets Previous tests, exams
2 weeks	LO4	<i>Revision, consolodation and extension</i> <ul style="list-style-type: none"> Programming 	Daily: Assignments	Textbook Worksheets Previous tests, exams
2 weeks	ALL		PoA: Exam	SAG

Grade 12:

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
Being an informed citizen in a global world				
Term 1				
1 week	12.4.4	<i>GUI</i> <ul style="list-style-type: none"> • Menus • Multiple forms / pages • Navigation techniques 	Daily: Assignments	Textbook
2½ weeks	12.4.11 12.4.12	<i>Programming</i> <ul style="list-style-type: none"> • Classes and objects • Inheritance 	Daily: Assignments	Textbook
1 week	12.1.3 12.1.17	<i>Understanding computers</i> <ul style="list-style-type: none"> • Factors affecting overall performance of a computer system such as CPU, memory, cache memory, secondary storage, bus types/design, heat sink/fan • Techniques to improve processor speed 	Daily: Debate Assignments	Textbook
1 week	12.4.11 12.4.12	<i>Programming</i> <ul style="list-style-type: none"> • Text files 	Daily: Assignments	Textbook
1 week	12.4.17 12.4.18	<i>Database</i> <ul style="list-style-type: none"> • Redundancy and Normalisation • SQL 	Daily: Assignments	Textbook
1 week	12.2.8 12.2.9 12.3.6	<i>Information-driven society</i> <ul style="list-style-type: none"> • Value of information • Issues such as copyright, intellectual property • Security issues such as digital signatures, digital certificates, passwords, encryption, SSL 	Daily: Assignments PoA: Survey Ethical issues	Textbook SAG
1½ week	12.4.11 12.4.12 12.4.17 12.4.18 12.4.19	<i>Programming and database</i> <ul style="list-style-type: none"> • Manipulate database through programming language 	Daily: Assignments	Textbook
½ week	12.4.13 12.4.14 12.4.15 12.4.16	<i>Error free computing</i> <ul style="list-style-type: none"> • Dangers of software which has bugs in it • Data validation and verification • Overflow and truncation • Error handling • Debugging programmes 	Daily: Assignments Case studies PoA: Practical Test Database and programming language	Textbook SAG
½ week	12.1.11 12.1.17	<i>Operating system</i> <ul style="list-style-type: none"> • Types • Specifications • Hardware configurations 	Daily: Investigate Debate Assignments	Textbook OS
1 week	12.1.4 12.1.11 12.1.17	<i>Troubleshooting</i> <ul style="list-style-type: none"> • Utility software • Computer configurations – common problems 	Daily: Assignments	Textbook OS
Term 2				
1 week	12.2.5 12.2.9 12.3.2	<i>Information-driven society</i> <ul style="list-style-type: none"> • Availability of information • Validity of sources and information • Authentication • Verification 	Daily: Assignments Debates Case studies	Textbook Internet

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
1 week	12.4.2 12.4.16	<i>Spreadsheets</i> <ul style="list-style-type: none"> What if-scenarios Solving real life problems using Excel 	Daily: Assignments	Textbook
½ week	12.4.20	<i>Software development</i> <ul style="list-style-type: none"> Arrays – 2 D 	Daily: Assignments	Textbook
1 week	12.4.6 12.4.21	<i>Getting help</i> <ul style="list-style-type: none"> Context sensitive help FAQs 	Daily: Assignments PoA: Task Online help /FAQ system	Textbook Internet Email SAG
3 weeks	12.4.4 12.4.6 12.4.11 to 12.4.20	<i>Programming and software development</i> <ul style="list-style-type: none"> Problem-solving – real life problems Develop solutions for scenarios 	Daily: Assignments	Textbook
½ week	12.2.6 12.2.8 12.2.9 12.3.6	<i>Information-driven society</i> <ul style="list-style-type: none"> Internet security issues such as spyware, adware, popups, hacking, phishing Security regarding online transactions such as online banking Strategies to secure data and transactions 	Daily: Assignments Debate Case studies	Textbook Internet
1 week		PAT – Programming projec - start	PoA: PAT	
2 weeks			PoA: Exam	SAG
Term 3				
3 weeks	12.4.4 12.4.6 12.4.11 to 12.4.20	<i>Programming and software development</i> <ul style="list-style-type: none"> Problem-solving – real life problems Develop solutions for scenarios Documentation 	Daily: Assignments PoA: Practical test Spreadsheets and database	Textbook SAG
½ week	12.3.2 12.3.6 12.3.11	<i>Information-driven society</i> <ul style="list-style-type: none"> Use of computers across a range of application areas such as education, entertainment, security Capabilities and limitations of ICTs Responsible and ethical use of computers 	Daily: Assignments Investigation Debate Case studies	Textbook Internet
1 week	12.1.8 12.1.9 12.1.11 12.1.17	<i>Buying hardware and software</i> <ul style="list-style-type: none"> Makes recommendations for a hardware solution for a given problem Recommends an operating system for a specific hardware configuration Critically appraises a given specification for computer-based solution 	Daily: Assignments Investigation Debate Case studies	Textbook Internet
½ week	12.3.6 12.3.9	<i>Computer-based solutions</i> <ul style="list-style-type: none"> Solutions to issues of national and International importance such as elections, census, weather Responsible and ethical use of resources Right to access vs right to privacy of information 	Daily: Assignments Investigation Debate Case studies	Textbook
½ week	12.1.4	<i>Solving problems</i> <ul style="list-style-type: none"> Troubleshooting hardware and software 	Daily: Assignments	Textbook SAG

TIME FRAME	LOs and ASs	CONTENT & CONTEXT (See Content / Subject Framework)	ASSESSMENT (See Subject Assessment Guidelines)	RESOURCES
½ week	12.3.10 12.3.11	<i>Global citizen</i> <ul style="list-style-type: none"> • Global community – e-communications • Cultral impact • Consequences such as social, political, economic of search engines and group communication 	Daily: Assignments Investigation	Textbook Internet
1 week	12.4.4 12.4.6 12.4.11 to 12.4.20	<i>Programming and software development</i> <ul style="list-style-type: none"> • Problem-solving – real life problems • Develop solutions for scenarios • Documentation 	Daily: Assignments	Textbook
1 week		<i>Finalise PAT</i>	PoA – PAT	SAG
3 weeks	ALL		PoA –Exam	SAG
Term 4				
1½ week	LO1 LO2 LO3	<i>Revision, consolidation and extension</i> <ul style="list-style-type: none"> • Hardware and software • E-communication • Social and ethical issues 	Daily: Assignments	Textbook Worksheets Previous tests, exams
2½ weeks	LO4	<i>Revision, consolidation and extension</i> <ul style="list-style-type: none"> • Programming 	Daily: Assignments	Textbook Worksheets Previous tests, exams
4 weeks	ALL		PoA: Exam	SAG