

INFORMATION TECHNOLOGY

General Certificate of Education (Ordinary Level)

1.0 RATIONALE

The Information and Communication Technology sector is acknowledged worldwide as a tool that could be used to increase the productivity, efficiency and effectiveness of work. This technology has enabled dramatic changes in the job market and the way workers are communicating with each other and performing job related activities. Every sector of the economy is forced to use this technology to make their work effective and efficient and thereby maintain a competitive edge. Therefore, those who enter into the job market should acquire proper IT skills to find an employment in the modern business world without much difficulty. However, in Sri Lanka the level of IT skills of majority of the students is not adequate to meet the current requirements of the business and industry. This is mainly due to lack of opportunities for students to study IT related subjects in the school curricular. Therefore, it is very important to bridge the gap between requirements of the industry and quality of education standards through the curriculum, providing transferable skills and competencies related to the world of work. Especially the ICT and entrepreneurial skills of students should be developed. The student should learn at school a wide variety of competencies for different needs of life in the changing world. They should have various views and different ways to continue studies and proceeded to employment.

Since Sri Lanka is in the early stages of introducing ICT to lower grades, the present syllabus does not demand any ICT knowledge as an entry requirement. Therefore, this syllabus is intended to introduce ICT as a technical subject to be offered at the G.C.E (O/L). The main objective of this syllabus is to develop the competencies to use the ICT tools and to build a basic theoretical base for students to pursue higher studies in ICT.

2.0 COURSE OBJECTIVES

- Impart basic computer literacy and develop a base for further studies in Information & Communication Technology
- Develop the understanding of use of different types of ICT applications and the effects of their use
- Develop the concept and principles related to ICT
- Improve the skills necessary for the development of ICT based solutions for real world problems
- Make aware the benefits and problems of ICT use

3.0 EXPECTED ENTRY BEHAVIOR / COMPETENCIES

Grade 9 result of mathematics should be considered for selection of students

4.0 SUBJECT CONTENT, LEARNING OUTCOMES AND QUALITY INPUTS

Special Requirements:

- Medium of instruction should be students' medium of instruction for O/L
- English technical terms should not be translated to sinhala/ tamil.
- National level examination papers should be given in the students' medium of instruction for O/L

Unit Summary	Periods	
	Theory	Particles
Unit 1. Fundamentals of ICT	10	03
Unit 2. Data Representation and Internal Operations of the Computer	11	02
Unit 3. Generic Software	08	44
Unit 4. Information Systems	26	-
Unit 5. Programming Concepts	17	35
Unit 6. Web Site Development	08	18
Unit 7. ICT and Society	13	-
Unit 8. Group Project	13	-

Unit 1. Fundamentals of ICT

Contents (Units)	Methodology	Time Allocation (in periods)
1.1 Introduction to ICT 1.1.1 Use and importance of ICT in the economy 1.1.2 Data and Information 1.1.3 ICT tools(Associated components of ICT)	<ul style="list-style-type: none"> • Describe usage and importance of ICT • Appreciate the role of ICT in the economy • Distinguish between data, information and Data processing • Explain briefly properties of information • List ICT tools • Describe usage 	2
1.2 Introduction to computers 1.2.1 Evolution of a computer to the present state 1.2.2 Components and peripherals of a computer system 1.2.3 Classification of computers	<ul style="list-style-type: none"> • List landmarks in the history of computers • Classify microprocessor development • List hardware components of a computer system and explain each category in brief. • Identify computers according to size, technology and purpose 	4

1.2.4 Computer architecture (CPU, Memory, Input / output)	<ul style="list-style-type: none"> • Describe Input devices and their categories • Describe Output devices of a computer system • Briefly describe memory and storage devices of a computer • Briefly describe the processing unit used in computers 	
1.3 Software 1.3.1 System software 1.3.2 Application software	<ul style="list-style-type: none"> • Explain the importance of System Software in a Computer • Explain that hardware without OS is useless • Explain the need of application software • Use OS interface to open applications • Use different software to accomplish different tasks 	2
1.4 Networking of computers 1.4.1 Advantages of networking 1.4.2 Types of Networks (LAN, WAN, Internet, Intranet)	<ul style="list-style-type: none"> • Compare and contrast advantages and disadvantages of computer networks • Explain data communication briefly • Explain different types of media and accessories used in networking • Briefly explain the types of network 	2
1.5 Hands on training 1.5.1 Connecting peripherals 1.5.2 Running a menu driven application package 1.5.3 Handling a computer	<ul style="list-style-type: none"> • Demonstrate how peripherals can be Connected to a computer • Give hand on training in running a menu driven application package in a computer • Boot up and Shutting down the computer • Creating files and directories 	3

Learning Outcomes:

The student will be able to

- Appreciate the use of ICT for efficiency and effectiveness of organizations
- Identify and describe the components of computer systems
- Distinguish between hardware, software and live ware
- Distinguish between operating systems and application software
- Understand the importance of computer networks
- Connect a computer and use it for a simple application

Quality Inputs:

- Laboratory with minimum of five computers

Unit 2. Data Representation and Internal Operations of the Computer

Contents (Units)	Methodology	Time Allocation (in periods)
2.1 Introduction to number systems 2.1.1 Binary, octal, hexa decimal 2.1.2 Conversion between number systems	<ul style="list-style-type: none"> Analyze the number systems and their importance in relation to the computer and IT. Explore how numbers are formed in our decimal number system Perform calculations between different number systems (Decimal, Binary, Octal and Hexadecimal). 	3
2.2 Data representation 2.2.1 Bit, Byte 2.2.2 ASCII, BCD	<ul style="list-style-type: none"> Explain how data are represented inside the computer Explore how data are coded in the computer (ASCII, BCD). 	1
2.3 Boolean algebra 2.3.1 Basic laws in Boolean algebra 2.3.2 Truth tables	<ul style="list-style-type: none"> Explore basic laws of Boolean algebra Draws truth tables to show basic operations in the computer. 	4
2.4 Logic gates and circuits 2.4.1 AND, OR, NOT Gates 2.4.2 Combinations of gates (NAND, NOR)	<ul style="list-style-type: none"> Explain the operations of basic logic operators Explain the operations of combinations of logic gates Design simple circuits to show the functions of gates. 	2
2.5 Operating systems 2.5.1 GUI operating systems 2.5.2 Files and directories	<ul style="list-style-type: none"> Distinguish between GUI and CUI operating systems Identify features of DOS and Windows Explore advantages of Windows over DOS Perform different tasks in windows OS Seek the advantages of the use of Windows as OS 	2

2.6 Functions of operating systems		
2.6.1 Memory management	<ul style="list-style-type: none"> • Explain why memory management is needed 	1
2.6.2 Input / Output operations management	<ul style="list-style-type: none"> • Explain how I/O devices are controlled by the OS 	
2.6.3 Process management	<ul style="list-style-type: none"> • Explain the concept of Multi Tasking 	

Learning Outcomes:

Student will be able to

- understand different number systems used in computer systems
- understand the inner workings of computers
- appreciate the functions of the operating system
- use the functions of operating systems

Quality Inputs:

- Laboratory with minimum of five computers with a GUI Operating system

Unit 3. Generic Software

Contents (Units)	Methodology	Time Allocation (in periods)
<p>3.1 Word processing, desktop publishing</p> <p>3.1.1 Introduction to word processing, desktop publishing and graphics software.</p> <p>3.1.2 Formatting a document, working with graphics and drawing objects, creating and customizing tables.</p>	<ul style="list-style-type: none"> • Creating and Manipulating a document using a Word Processing package • Use graphics and drawing objects in documents • Insert tables into documents and acquire ability of customizing table 	13
<p>3.2 Presentation Software</p> <p>3.2.1 Creating slide shows including audio, video and digital images</p>	<ul style="list-style-type: none"> • Explain the features of a multimedia presentation • Create a slide show containing multimedia features 	8
<p>3.3 Electronic spreadsheets</p> <p>3.3.1 Brief introduction to electronic spreadsheets.</p> <p>3.3.2 Working with worksheets and editing worksheet data.</p> <p>3.3.3 Formatting and Printing worksheets.</p> <p>3.3.4 Performing analysis on worksheet data.</p>	<ul style="list-style-type: none"> • List various spreadsheet packages • Describe the usage of spread sheet packages • Insert data into a worksheet • Edit and deletes worksheet data • Format a worksheet • Take a print out of a worksheet • Use spreadsheet functions • Create Graphs 	9
<p>3.4 Database software</p> <p>3.3.1 Brief introduction to databases.</p> <p>3.3.2 Creating and designing tables</p> <p>3.3.3 Working with simple queries.</p>	<ul style="list-style-type: none"> • Define a database • Prepare a list of various DBMS software packages • Create a database • Identify the objects of a database • Create a table and enter data into the table • Explain Primary key, Foreign key, Relationship • Use simple queries to query a database 	13

3.3.4 Generating forms.	<ul style="list-style-type: none"> • Create various forms to enter data to tables in a database 	
3.3.4 Generating reports.	<ul style="list-style-type: none"> • Create various reports using a database • Take printout of created reports 	
3.5 Communication software		
3.5.1 Internet Browsers	<ul style="list-style-type: none"> • Explain the use of a Internet Browsers • List Internet Browsers 	
3.5.2 Search Engines	<ul style="list-style-type: none"> • Identify Internet as a huge information source • Use various searching methods and techniques • Download user required information 	9
3.5.3 e-Mail	<ul style="list-style-type: none"> • Create own Email accounts using online service e.g.: Hotmail 	
3.5.4 Chat	<ul style="list-style-type: none"> • Use chat facility to communicate with others 	
3.5.5 Video Conferencing	<ul style="list-style-type: none"> • Appreciate video conferencing as an economical method for communication 	

Learning Outcomes:

The student will be able to

- use features of word processing, desk top publishing
- identify, select and integrate audio, video and digital images for multimedia presentations
- use electronic spreadsheets for analysis, organizing and displaying numeric data
- design and manipulate databases and generate customized reports
- use the internet for information retrieval and communication.

Quality Inputs:

- Laboratory with minimum of five computers
- Word processing software
- Spreadsheet software
- Presentation software
- Database software
- Internet access facility (within or outside the school)

Unit 4. Information Systems

Contents (Units)	Methodology	Time Allocation (in periods)
<p>4.1 Introduction to Systems.</p> <p>4.1.1 System composition</p> <p>4.1.2 Organizations as systems</p>	<ul style="list-style-type: none"> • Identify the main activities in a simple system and how they work on each component • Identify nature of a natural system. • Describe elements of a system. • Discuss the interrelation. • Identify organization as a system. • Describe the importance of information in decision- Making. • Identify manual information systems and computer based information systems. • Classify independent elements of a computer based information system. 	5
<p>4.2 Types of processing Systems.</p> <p>4.2.1 Batch processing</p> <p>4.2.2 On line Real time processing</p>	<ul style="list-style-type: none"> • Identify the steps involved in Batch Processing • Explain the need of online real time processing systems • Compare online systems with bath processing systems 	4
<p>4.3 Types of Information Systems.</p> <p>4.3.1 Office automation system.</p> <p>4.3.2 Transaction processing system</p> <p>4.3.3 Management information system.</p> <p>4.3.4 Processing control system.</p>	<ul style="list-style-type: none"> • Identify the main activities in an OAS and how they work. • Identify the differences between the manual system and OAS • Identify the main components of a TPS and how they work. • Identify the differences between the manual system and automated TPS • Discuss the decision making process in an organization • Identify the different types of MIS • State advantages and disadvantages of manual and automated systems • Identify manual processing plants in the environment • State main features of process control 	8

4.3.5 Intelligent information system	systems <ul style="list-style-type: none"> • State advantages and disadvantages of manual and automated systems • Identify the characteristics of an Intelligent Information Systems. • Compare IIS with other computerized systems 	
4.4 Introduction to system development life cycle. 4.4.1 Analysis 4.4.2 Design. 4.4.3 Implementation and testing 4.4.4 Maintenance	<ul style="list-style-type: none"> • Discuss the steps in system analysis • Discuss the steps in system Design • Discuss the software development testing and conversion process • Discuss the need of software maintenance • Discuss why development life cycle 	9

Learning Outcomes:

- Student will be able to
- Explain the system concepts
- Identifies different types of system
- Identify different of types of processing.
- Identify the steps of the Systems Development Life Cycle

Quality Inputs:

- None

Unit 5. Programming Concepts

Contents (Units)	Methodology	Time Allocation (in periods)
5.1 Introduction to programming 5.1.1 What is a program? 5.1.2 Programming Languages (classifications, Generations, Compilers/Interpreters)	<ul style="list-style-type: none"> • Explain what a program is and how it works • Identify types of Programming languages and their generations • Explain the usage and difference between Compilers and Interpreters 	5
5.2 Algorithms (Flowcharts and Pseudo Codes)	<ul style="list-style-type: none"> • Discuss the different steps in solving a problem. • Discuss characteristics that must be included in an algorithm. • Explore method of writing pseudo codes. • Explore method of drawing flowcharts • Analyze algorithm for a set of simple problems. 	5
5.3 Data types and operators	<ul style="list-style-type: none"> • Identify basic features of a Visual programming language. • Explain basic data types of the Visual programming language. • State the operators in the Visual programming language. 	7
5.4 Control Structures 5.4.1 Sequence 5.4.2 Selection 5.4.3 Repetition	<ul style="list-style-type: none"> • Explain the concept of structured programming. • Explain how three control structures are used • Identify statements for making decisions and writing relevant programs. • Identify statements for repetitions and writing of relevant programs 	9
5.5 Data input/output	<ul style="list-style-type: none"> • Explore user interface. • Analyze methods of data inputs and outputs 	7
5.6 Arrays	<ul style="list-style-type: none"> • Explain the use of arrays in computer programs • Write programs using arrays 	4

5.7 Sub Routines	<ul style="list-style-type: none"> • Explain the concept of modularity • Introduce different types of subroutine techniques (functions and procedures). 	4
5.8 Database handling	<ul style="list-style-type: none"> • Discuss how to connect a table with data controls • Discuss how to connect a form with data controls 	11

Learning Outcomes:

Student will be able to

- identify computer languages and their classifications
- suggest a methodology / algorithm to solve a simple problem
- apply data types and operators
- create an interfaces with components .
- use control structures in a programme.
- solve a simple problem writing a computer program

Quality Inputs:

- Laboratory with minimum of five computers
- Visual Programming Language

Unit 6. Web Site Development

Contents (Units)	Methodology	Time Allocation (in periods)
6.1 Web Page Development 6.1.1 Fundamentals of HTML and XML 6.1.2 Creating a simple Web Page 6.1.3 Creating and linking multiple pages	<ul style="list-style-type: none"> • Explain the features of HTML and XML • Identify the differences between HTML and XML • Use HTML as primary web design language • Use HTML to link multiple pages of a web site 	7
6.2 Web Development Tools	<ul style="list-style-type: none"> • Design and create web pages using available package (Authoring tool) 	5
6.3 Requirements of Web Publishing 6.3.1 ISP 6.3.2 Web Server 6.3.3 URL 6.3.4 IP address	<ul style="list-style-type: none"> • Explain the need of a Internet Service Provider for Web Publishing • List ISP Providers • Explain the need of a Web Server for Web Publishing • List Web Servers • Explain what a URL is • List different groups of URLs • Explain what a domain name is • Explain the link between domain name and IP address 	3
6.4 Design multimedia content for websites 6.4.1 Graphic designing 6.4.2 Animation 6.4.3 Sound recording	<ul style="list-style-type: none"> • Classifying various graphic design packages, according to their usage • Design graphics and logos • Edit photographs • Create and edit and animations • Practice sound recording and editing of sound clips 	11

6.4.4 Incorporating Audio and video animations.	<ul style="list-style-type: none"> • Explain how Audio, video and animation can be used in web pages • Design web pages incorporating audio video 	
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Learning Outcomes:

Student will be able to

- create simple web pages
- use web development tools
- create, edit, modify audio and video clips using software for web sites.
- identify the requirement of web publishing.

Quality Inputs:

- Laboratory with minimum of five computers
- Web design tools
- Simple software tools for Audio and Video editing

Unit 7 ICT and Society

Contents (Units)	Methodology	Time Allocation (in periods)
7.1 ICT for National Development 7.1.1 Health 7.1.2 Education 7.1.3 Agriculture 7.1.4 Industries 7.1.5 Other services	<ul style="list-style-type: none"> • Introduction to Information Technology and society • Discuss how IT Applications can be used in the health sector • Discuss how IT Applications can be used in the education sector • Discuss how IT Applications can be used in the agriculture sector • Discuss how IT Applications can be used in the manufacturing industries • Discuss how IT Applications can be used in other services (Banking, Insurance etc.) 	7
7.2 Issues in use of ICT 7.2.1 Ethical 7.2.2 Legal 7.2.3 Security 7.2.4 Health and Safety 7.2.5 Social issues	<ul style="list-style-type: none"> • Discuss current ethical issues in use of ICT • Discuss applicable laws and regulations required in relation to copyright / patent • Explain physical and logical security • Discuss types of computer viruses and their effects. • Discuss how to protect Computer Systems from Viruses • Discuss occupational hazard possible due to the heavy use of IT equipment • Discuss possible measures to be taken for safety and health • Discuss the social issues of not having access to ICT facility for every body I the society 	6

Learning Outcomes:

Students will be able to

- discuss merits and demerits of usage of ICT for National Development.
- understand legal and ethical issues in the use of ICT.
- gain knowledge of occupational hazards and social issues in the use of ICT .

- take suitable precautions to protect hardware and software.

Quality Inputs:

- None

Unit 8 Group Project

Students should undertake a group project to develop a computerized solution for a simple real world problem. The maximum number of students in a group should be five. Firstly, the group should identify/find a manual system for computerization. Thereafter, the groups should analyze the manual system to identify problems in the existing system and proposed and implement a solution using appropriate IT tools. They should use appropriate steps of the system development life cycle and submit a report containing all the steps involved in design and development. The output of the new system should be presented in the report.

Project activity should be started at the beginning of grade eleven term-one and should be continued throughout the year. Before commencement and after completion of each phase of the project teacher should discuss the process and progress of the project with each group in the class.

Following time allocation is a guideline for class discussions.

Contents (Units)	Methodology	Time Allocation (in periods)
8.1 Introduction	<ul style="list-style-type: none"> • Explain the types of projects that students can undertake • Divide class into a few groups 	1
8.2 System Analysis	<ul style="list-style-type: none"> • Discuss Data and fact gathering techniques Such as interviews, questionnaires, observations, sampling of existing documentation • Guide the groups to study the data and fact gathering techniques visiting different sites. • Compare and contrast the strengths and weaknesses of the systems visited 	4
8.3 System Design	<ul style="list-style-type: none"> • Discuss user requirements, project boundary, resource limitations • Guide the groups to list required data inputs, outputs and data tables of their systems • Guide the groups to collect information on required computer hardware of their systems 	4
8.4 System Implementation	<ul style="list-style-type: none"> • Explain how the prototype development should be carried out 	2

8.5 Project Presentation	<ul style="list-style-type: none"> • Explain the content of the project report and project presentation 	2
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Learning Outcomes:

Student will be able to

- understand a problem and break it down into sub problems
- design an Information System to solve the problem
- select appropriate ICT tools to develop the system
- develop the prototype of the system

Quality Inputs:

- Laboratory with minimum of five computers
- Laboratory facility should be available outside the allocated lab/ School hours

5.0 MINIMUM QUALITY INPUTS

5.1 Human Resources

Teachers with following qualifications are required to teach this subject.

- University degree or diploma in Computer Science/ Information Technology
- University degree or diploma with Computer Science/ Information Technology as a subject
- Followed the training program given by the National Institute of Education or Provincial Authorities of the Ministry of Education for O/L IT
- Any other qualification recognized by the Ministry of Education for O/L IT.

5.2 Physical Resources

5.2.1 Capital Resources

- Laboratory with minimum of five computers with a GUI Operating system
- Word processing software
- Spreadsheet software
- Presentation software
- Database software
- Visual Programming Language
- Web design tools
- Simple software tools for Audio and Video editing
- Internet access facility (within or outside the school)
- Laboratory facility should be available outside the allocated lab/ School hours

5.3 Infrastructure Facility

- Electricity supply

6.0 ASSESSMENT AND EVALUATION

6.1 School based assessment

- Written test should be held at the end of each term according to the guideline provided by NIE
- Project work should be assessed continuously on individual basis at the end of each phase by considering the contribution of the student to the group project.

6.2 National level examination

At the end of grade eleven national level examinations should be conducted in the following manner

- Multiple choice paper - One hour
- Structured paper - Two hours

7.0 EXPECTED EXIT BEHAVIOR / COMPETENCIES

The student will be able to

- Demonstrate knowledge and understanding of the components and functions of an information processing system
- Appreciate the potential of various ICT tools in information processing and uses these appropriately in problem solving
- Understand that ICT is a rapidly changing discipline and the necessity to keep pace with changes
- Use ICT to enhance learning
- Demonstrate an awareness of social, ethical and safety issues related to ICT
- Competent in analyzing a real world problem and provide solutions using ICT
- Demonstrate the ability to search, locate and evaluate various information sources and use that information for required purpose.