



# **Information and Communication Technology**

## **Grade 11**

### **Teacher's Guide**

**Effective from 2016**

Department of Information Technology

National Institute of Education

Maharagama

Sri Lanka

[www.nie.lk](http://www.nie.lk)

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Information and Communication Technology – Grade 11  
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## *Message from the Director General*

### *Teaching and Learning*

This Manual provides the teacher with the essentials required to implement the subject curriculum in their respective school. In implementing the curriculum, teachers must always bear in mind that their work will have paramount and far-reaching consequences for the child's *cognitive achievement* and *behavioural development*.

On the dimension of cognitive achievement, teachers must pay attention, *inter alia*, to the following where learning quality is higher:

- When the learner is aware of his/her life goals and the task is both relevant to goal achievement as well as abilities;
- When the learner is involved actively in the process of teaching/learning (student-centered process). Recall what Confucius said: *What they hear, they forget; What they see, they remember; & What they do, they learn.*
- When the learning environment is conducive, i.e. resourceful and challenging. Ensure access to study materials, equipment, labs, cases and experiences from multiple sources; and
- When the learner is given prompt feedback, both positive and constructive. In doing so, enable the learning to occur sequentially with higher levels of absorption, and integration with existing knowledge, skills and goals of the learner.

In education, expectation of the government is to enable all children in schools to reach the required levels of mastery of fundamentals of the subject matter, so that they experience the joy of achievement after facing examinations.

In the dimension of behavioural development of the child, the objective of education is to link cognitive achievement with the world of work. Therefore, curriculum delivery in the hand of teacher must foster the competencies that the learner requires to possess in dealing with the world outside the school. Some of the important, generic competencies are in these areas:

- Industrious work ethic – Positive attitudes, will to innovate, and persevere;
- Interpersonal relations - Teamwork, discipline, and effective communication;
- Moral values – A person with integrity possessing civic values such as respect for diversity

In conclusion, I wish to ask all principals, teachers and other staff in schools to look at the process of teaching and learning with attention to **4AS** in management: **A**ttitude, **A**nalysis, **A**ction, & **A**ccountability. Start with the relevant and positive *attitudes* about the ends and means of what you do (your lesson, etc.); search, obtain and *analyse* information in order to organize (session plans etc.); consider options and take prompt action efficiently (deliver); and monitor, assess and measure results to take *accountability* (ownership).

I take this opportunity to wish all the teachers involved the joy of teaching and learning. Please do not hesitate to write to the relevant Head of Department at NIE, with copy to me where desirable, on your experiences and observations of this Manual.

Prof. Gunapala Nanayakkara, PhD (Carleton)  
*Director General*

### *Message from the Deputy Director General*

Education from the past has been constantly changing and forging forward. In recent years, these changes have become quite rapid. Past two decades have witnessed a high surge in teaching methodologies as well as in the use of technological tools and in the field of knowledge creation.

Accordingly, the National Institute of Education is in the process of taking appropriate and timely steps with regard to the education reforms of 2015.

It is with immense pleasure that this Teachers' Guide where the new curriculum has been planned based on a thorough study of the changes that have taken place in the global context adopted in terms of local needs based on a student-centered learning-teaching approach, is presented to you teachers who serve as the pilots of the schools system.

An instructional manual of this nature is provided to you with the confidence that, you will be able to make a greater contribution using this.

There is no doubt whatsoever that this Teachers' Guide will provide substantial support in the classroom teaching-learning process at the same time. Furthermore the teacher will have a better control of the classroom with a constructive approach in selecting modern resource materials and following guide lines given in this book.

I trust that through the careful study of this Teachers Guide provided to you, you will act with commitment in the generation of a greatly creative set of students capable of helping Sri Lanka move socially as well as economically forward.

This Teachers' Guide is the outcome of the expertise and unflagging commitment of a team of subject teachers and academics in the field Education.

While expressing my sincere appreciation of this task performed for the development of the education system, my heartfelt thanks go to all of you who contributed your knowledge and skills in making this document such a landmark in the field.

M.F.S.P. Jayawardhana  
Deputy Director General  
Faculty of Science and Technology

*Forward of the Commissioner General of Educational Publication*

## Curriculum Revision Committee

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## **Instructions for the use of the Teachers' Guide**

This Teachers' Guide covers all competency levels of the Grade 11 ICT syllabus and is designed as relevant to the learning- teaching process. In addition to the competency levels and subject matter, some more related concepts and terms have also been highlighted. The objective is to provide the user with more in depth understanding of the syllabus. The guidance for lesson plans may be modified by the teacher to suit the relevant context. The assessment and evaluation guidance may also be modified according to the needs of the situation. Quality inputs mentioned in this case are the specified websites.

Guidance is provided for the preparation of lab-sheets and it is very important to involve students in laboratory practicals as these provide them with better understanding of the subject matter and could lead them to develop skills necessary to ensure a better place in the world of work that demands ICT applications.

The contributions extended by Dr. H.L. Premarathne ,Senior Lecturer, University of Colombo School of Computing and Dr. L. Ranathunga, Head of the Department of Information Technology, Faculty of Information Technology University of Moratuwa in the finalization of this Teacher's Guide are very much appreciated.

For laboratory practicals, following items of software are recommended.

Programming Languages – Pascal (or Python – See the comments)

Image editing – GIMP

2D Animation – VectorianGiotto

Audio Editing - Audacity

CMS- Joomla

XAMPP



# **Information and Communication Technology Syllabus Grade 11**

**To be implemented from 2016**

**Department of Information Technology  
Faculty of Science and Technology  
National Institute of Education  
Maharagama  
Sri Lanka  
[www.nie.lk](http://www.nie.lk)**

## **1. Introduction**

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. However, in Sri Lanka, the level of ICT skills of the majority of the students is not adequate to meet the current requirements of business and industry. This is mainly due to the lack of opportunities for students to study ICT related subjects in the school curriculum. The student should learn at school a wide variety of competencies for different needs of life in the changing world. They should develop their own views and different ways to continue their studies and proceed for employment.

ICT education for the schools in Sri Lanka is still in the stage of introducing it to the lower grades. Therefore 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) Examination. The main objective of this syllabus is to develop the competencies to use ICT tools and to build a basic theoretical base for students to pursue higher studies in ICT.

The syllabus of Grade 11 has been thoroughly revised especially in the area of programming. The dependence on a software tool has been removed and greater emphasis is placed on logical thinking which is a transferable skill to programming in any computer language. Certain subject areas have also been reorganized to meet current developments in the world of ICT.

## **2. National Goals**

1. Nation building and the establishment of a Sri Lankan identity through the promotion of national cohesion, national integrity, national unity, harmony, and peace, and recognizing cultural diversity in Sri Lanka's plural society within a concept of respect for human dignity.
2. Recognizing and conserving the best elements of the nation's heritage while responding to the challenges of a changing world
3. Creating and supporting an environment imbued with the norms of social justice and a democratic way of life that promotes respect for human rights, awareness of duties and obligations, and a deep and abiding concern for one another.
4. Promoting the mental and physical well-being of individuals and a sustainable life style based on respect for human values.
5. Developing creativity, initiative, critical thinking, responsibility, accountability and other positive elements of a well-integrated and balanced personality.
6. Human resource development by educating for productive work that enhances the quality of life of the individual and the nation contributing to the economic development of Sri Lanka.
7. Preparing individuals to adapt to and manage change, and to develop capacity to cope with complex and unforeseen situations in a rapidly changing world.
8. Fostering attitudes and skills that will contribute to securing an honorable place in the international community, based on justice, equality and mutual respect.

National Education Commission Report (2003).

### 3. Basic Competencies

The following Basic Competencies developed through education will contribute to achieving the above National Goals:

#### 1. Competencies in Communication

**Competencies in communication are based on four subsets: Literacy, Numeracy, Graphics and IT proficiency.**

Literacy: Listen attentively, speak clearly, read for meaning, write accurately and lucidly and communicate ideas effectively.

Numeracy: Use numbers for things, space and time, count, calculate and measure systematically.

Graphics: Make sense of line and form, express and record details, instructions and ideas with line form and colour.

IT proficiency: Computer literacy and the use of information and communication technologies (ICT) in learning, in the work environment and in personal life.

#### 2. Competencies relating to Personality Development

- Generic skills such as creativity, divergent thinking, initiative, decision making, problem solving, critical and analytical thinking, team work, inter – personal relations, discovering and exploring
- Values such as integrity, tolerance and respect for human dignity
- Emotional intelligence.

#### 3. Competency related to environment

**These competencies are related to the environment: social, biological and physical.**

Social Environment: Awareness of the national heritage, sensitivity and skills linked to being members of a plural society, concern for distributive justice, social relationships, personal conduct, general and legal conventions, rights, responsibilities, duties and obligations.

Biological Environment - Awareness, sensitivity and skills linked to the living world, people and the ecosystem, the trees, forests, seas, water, air and life – plant, animal and human life.

Physical Environment - Awareness, sensitivity and skills linked to space, energy, fuels, matter, materials and their links with human living , food, clothing, shelter, health, comfort, respiration, sleep, relaxation, rest, wastes and excretion.

Included here are skills in using tools and technologies for learning, working and living.

**4. Competencies relating to preparation for the World of Work.**

**Employment related skills to maximize their potential and to enhance their capacity**

- To contribute to economic development
- To discover their vocational interests and aptitudes
- To choose a job that suits their abilities, and
- To engage in a rewarding and sustainable livelihood

**5. Competencies in relation to Religion and Ethics**

Assimilating and internalizing values, so that individuals may function in a manner consistent with the ethical, moral and religious modes of conduct in everyday living, selecting that which is most appropriate.

**6. Competencies in Play and the Use of Leisure**

Emotions of Pleasure, Joy, and such human experiences as expressed through aesthetics, literature, play, sports and athletics, leisure pursuits and other creative modes of living.

**7. Competencies relating to ‘ learning to learn’**

Empowering individuals to learn independently and to be sensitive and successful in responding to and managing change through a transformative process, in a rapidly changing, complex and interdependent world.

#### **4. Aims of the Information and Communication Technology Curriculum**

Such a surge in the growth, development and application of Information Communication Technology as today has never been experienced before. The importance and relevance of ICT to almost all walks of life today has made it all the more important that knowledge and expertise, both practical and theoretical, of its application should begin at the very grassroots level of education.

Aims to be achieved through the course are as follows:

- Inculcate basic computer literacy and develop a base for further pursuit of Information Technology and Communication Technology studies.
- Develop understanding of the use and resultant outcomes of the use of different types of ICT applications.
- Develop concepts and principles related to ICT.
- Improve skills required for the development of ICT based solutions for real world problems.
- Provide awareness of benefits and problems of ICT use to participants

## 5. Syllabus of G.C.E. (O/L) ICT: Grade 11

### Subject Content and Duration in terms of Competencies and Competency Levels

Competency	Competency Level	Content	Learning outcome	Periods
<b>10. Writes programs to solve problems</b>	<b>10.1. Analyzes the problem</b>	<ul style="list-style-type: none"> <li>• Identification of inputs and outputs</li> <li>• Identification of possible alternate process steps</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies inputs and outputs</li> <li>• Explores solution space</li> </ul>	2
	<b>10.2 Uses control structures in developing algorithms to solve problems.</b>	<ul style="list-style-type: none"> <li>• Introduction to algorithms: purpose</li> <li>• Control structures for developing algorithms                             <ul style="list-style-type: none"> <li>○ Sequence</li> <li>○ Selection</li> <li>○ Iteration (Repetition)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Explains purpose of algorithms</li> <li>• Describes control structures</li> <li>• Applies control structures to develop algorithms</li> </ul>	2
	<b>10.3 Uses different tools to present algorithms.</b>	<ul style="list-style-type: none"> <li>• Tools for developing algorithms                             <ul style="list-style-type: none"> <li>○ Flow charts</li> <li>○ Pseudo codes</li> <li>○ Conversion of flowcharts into pseudo codes</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Identifies symbols of flow charts</li> <li>• Explains structure of pseudo code</li> <li>• Draws flow charts to represent algorithms</li> <li>• Converts flow charts to pseudo code</li> </ul>	4

Competency	Competency Level	Content	Learning outcome	Periods
	<b>10.4 Uses data types in programming.</b>	<ul style="list-style-type: none"> <li>• Identifiers, reserved words and key words in a computer programming language</li> <li>• Variables and constants in computer programming</li> <li>• Description of data types               <ul style="list-style-type: none"> <li>○ Purpose of data types</li> <li>○ Use of meaningful names for identifiers</li> </ul> </li> <li>• Basic Data Types:               <ul style="list-style-type: none"> <li>○ Numeric (integer, floating point)</li> <li>○ Character</li> <li>○ Logical</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Declares identifiers using correct data types</li> <li>• Uses variables effectively in programs</li> </ul>	4
	<b>10.5 Uses operators in programming</b>	<ul style="list-style-type: none"> <li>• Purpose of operators</li> <li>• Basic operators               <ul style="list-style-type: none"> <li>○ Arithmetic operators</li> <li>○ Comparison operators</li> <li>○ Logical operators: AND, OR, NOT</li> </ul> </li> <li>• Operator precedence</li> <li>• Expressions</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Selects correct operators in computations</li> <li>• Applies operators effectively in programs</li> <li>• Evaluate results of expressions</li> </ul>	4

Competency	Competency Level	Content	Learning outcome	Periods
	<b>10.6 Develops programs involving selection control structure</b>	<ul style="list-style-type: none"> <li>• IF-EndIf and If-Else-EndIf statement</li> <li>• Use of switch/case when single variable has multiple conditions</li> <li>• Conversion of flow charts into pseudo codes and subsequent coding into a programming language</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies correct selection control structure.</li> <li>• Identifies correct selection condition.</li> <li>• Uses selection control structure in programs.</li> <li>• Combines selection control structures to meet programming needs.</li> </ul>	5
	<b>10.7 Develops programs involving basic iterations.</b>	<ul style="list-style-type: none"> <li>• Use of iterations (repetitions) in: <ul style="list-style-type: none"> <li>• Cases where the number of iterations are known</li> <li>• Cases where the number of iterations are unknown</li> </ul> </li> <li>• Checking of the condition for iterations <ul style="list-style-type: none"> <li>○ Beginning of the iteration</li> <li>○ End of the iteration</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Identifies correct iteration structure.</li> <li>• Applies correct condition to control iterations.</li> <li>• Uses iteration control structure in programs.</li> </ul>	7

Competency	Competency Level	Content	Learning outcome	Periods
		<ul style="list-style-type: none"> <li>• Conversion of flow charts into pseudo codes and subsequent coding using a programming language</li> </ul>		
	<p><b>10.8 Develops programs with nested control structures</b></p>	<ul style="list-style-type: none"> <li>• The purpose of using nested control structures</li> <li>• Use of control structures within another control structure <ul style="list-style-type: none"> <li>○ Selection within selection</li> <li>○ Iteration within iteration</li> <li>○ Iteration within selection</li> <li>○ Selection within iteration</li> </ul> </li> <li>• Conversion of flowcharts into pseudo codes and subsequent coding into a programming language</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies cases where nested control structures are required.</li> <li>• Uses nested control structures in programs.</li> </ul>	3

Competency	Competency Level	Content	Learning outcome	Periods
	<b>10.9 Develops programs using one dimensional arrays.</b>	<ul style="list-style-type: none"> <li>• The purpose of the use of arrays</li> <li>• Definition of the one dimensional array</li> <li>• Properties of an array               <ul style="list-style-type: none"> <li>○ Index</li> <li>○ Contiguous locations</li> <li>○ Random access</li> </ul> </li> <li>• Array Operations               <ul style="list-style-type: none"> <li>○ Declaration</li> <li>○ Accessing values</li> <li>○ Assignment of values</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Describes features of one dimensional arrays.</li> <li>• Carries out operations in arrays.</li> <li>• Uses one dimensional arrays in programs.</li> </ul>	3
	<b>10.10 Structures programs through the use of sub-programs.</b>	<ul style="list-style-type: none"> <li>• The purpose of the use of sub-programs               <ul style="list-style-type: none"> <li>○ Improvement of code reusability,</li> <li>○ Readability , ease of testing</li> <li>○ Maintainability</li> </ul> </li> <li>• Types of sub-programs: value turning and not returning</li> <li>• Structuring of programs using sub-programs Development of basic programs with a single sub-program</li> </ul>	<ul style="list-style-type: none"> <li>• Describes the need of sub-programs.</li> <li>• Demonstrates the use of value-returning and value-not returning sub-programs.</li> <li>• Uses sub-programs in programming.</li> </ul>	2

Competency	Competency Level	Content	Learning outcomes	Periods
	<b>10.11 Explores the evolution of programming languages.</b>	<ul style="list-style-type: none"> <li>• Low-level languages <ul style="list-style-type: none"> <li>○ Machine language</li> <li>○ Assembly language</li> </ul> </li> <li>• High-level languages</li> <li>• Types of high-level languages: <ul style="list-style-type: none"> <li>○ Procedural vs Declarative</li> <li>○ Structured vs Object oriented</li> <li>○ Programming vs scripting</li> </ul> </li> <li>• Methods used to convert source code to machine code <ul style="list-style-type: none"> <li>○ Interpreters</li> <li>○ Compilers</li> <li>Testing and debugging</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Compares and contrasts low-level and high-level languages.</li> <li>• Describes features of high-level languages.</li> <li>• Describes the operation of language translators.</li> </ul>	2
<b>11. Explores the Systems Development Life Cycle of information system development.</b>	<b>11.1 Describes the concept of information system.</b>	<ul style="list-style-type: none"> <li>• Definition of a system</li> <li>• Components of a system <ul style="list-style-type: none"> <li>○ Input</li> <li>○ Process</li> <li>○ Output</li> </ul> </li> <li>• Manual systems</li> <li>• Computer based systems</li> <li>• Information systems <ul style="list-style-type: none"> <li>○ Importance of Information in decision making</li> <li>○ Inputs, outputs, data-flows and processes</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Describes an information system.</li> <li>• Identifies the relationship between the components of an information system.</li> <li>• Explains the significance of an information system.</li> </ul>	4

Competency	Competency Level	Content	Learning outcome	Periods
	<b>11.2 Explains the Systems Development life cycle.</b>	<ul style="list-style-type: none"> <li>• The system development life-cycle               <ul style="list-style-type: none"> <li>○ Identification of requirements</li> <li>○ Design of the solution</li> <li>○ Implementation of the solution</li> <li>○ Testing of the solution</li> <li>○ Deployment of the solution</li> <li>○ Maintenance of the system.</li> </ul> </li> <li>• Difference between phased system development life-cycle and iterative increment life-cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Describes the stages in system development.</li> <li>• Provides examples of each stage.</li> </ul>	3
<b>12. Uses the Internet for information search and communication effectively.</b>	<b>12.1 Uses the Internet to access information</b>	<ul style="list-style-type: none"> <li>• Introduction to the Internet: URL, IP address and domain names.</li> <li>• Client-server operation: Bi-directional information flow between browser and the server</li> </ul>	<ul style="list-style-type: none"> <li>• Describes the operation of the Internet.</li> <li>• Explains the services of the Internet</li> <li>• Uses the services to obtain information.</li> </ul>	4

Competency	Competency Level	Content	Learning outcome	Periods
		<ul style="list-style-type: none"> <li>• Functions of the Internet: E-mail, WWW, ftp, remote access, file-sharing, streaming of media, cloud computing, search engines.</li> <li>• Domain name server and its purpose</li> </ul>		
	12.2 Uses the Internet for communication	<ul style="list-style-type: none"> <li>• e-mail accounts: Sending and receiving mails- to, from, bcc and cc, attachments, subject</li> <li>• Instant messaging services</li> <li>• Video-based communication</li> <li>• Social media networking</li> </ul>	<ul style="list-style-type: none"> <li>• Communicates via e-mail accounts.</li> <li>• Describes basic communication facilities available on the Internet.</li> </ul>	3
<b>13. Develops Multimedia contents to express ideas effectively.</b>	13.1 Creates effective still graphics using suitable graphic software.	<ul style="list-style-type: none"> <li>• Digital image elements: pixel, resolution, size, color</li> <li>• Image capacity and compression: lossy formats and lossless formats</li> </ul>	<ul style="list-style-type: none"> <li>• Describes properties of digital still images.</li> <li>• Creates images using software tools</li> </ul>	6

Competency	Competency Level	Content	Learning outcome	Periods
		<ul style="list-style-type: none"> <li>• Image types: raster and vector</li> <li>• Graphic types: raster and vector</li> <li>• Working knowledge of graphic software to perform the following basic operations               <ul style="list-style-type: none"> <li>○ Open, save and edit</li> <li>○ Importing images</li> <li>○ Sizing and transformation</li> <li>○ Selections, cut, crop, replace</li> <li>○ Working with layers</li> <li>○ Text editing and effects</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Edit digital graphics.</li> <li>• Uses basic text effects.</li> </ul>	

Competency	Competency Level	Content	Learning outcome	Periods
	<b>13.2 Creates effective 2D animations using suitable 2D animations software</b>	<ul style="list-style-type: none"> <li>• Animation basics: Layers, frames, timing, frame rate</li> <li>• Geometrical objects and shapes</li> <li>• Frame types: frame, key frame, initial frame, destination frame, blank key frame.</li> <li>• Animations               <ul style="list-style-type: none"> <li>• Frame by frame animation</li> <li>• Basic Tweening</li> </ul> </li> <li>• Publishing</li> </ul>	<ul style="list-style-type: none"> <li>• Describes basic features of 2D animations.</li> <li>• Creates basic animations using animation software tools</li> </ul>	4
	<b>13.3 Edit Audio and video contents using suitable software</b>	<ul style="list-style-type: none"> <li>• Recording audio content.</li> <li>• Editing (extracting a relevant segment from original content)</li> </ul>	<ul style="list-style-type: none"> <li>• Carries out basic audio editing using software.</li> <li>• Carries out basic video editing using software.</li> </ul>	2
	<b>13.4 Effectively integrates multimedia contents</b>	<ul style="list-style-type: none"> <li>• Integration of background images with animations</li> <li>• Integration of audio and video</li> </ul>	<ul style="list-style-type: none"> <li>• Designs multimedia according to basic requirements.</li> <li>• Integrate multimedia using software tools.</li> </ul>	2

Competency	Competency Level	Content	Learning outcome	Periods
<b>14. Develops websites incorporating multimedia technology.</b>	<b>14.1 Structures information for development of websites.</b>	<ul style="list-style-type: none"> <li>• Contents for websites</li> <li>• Analysis of the purpose and the audience</li> <li>• Organization of the content/messages</li> <li>• Design of the layout and structure: scheme, color, font.</li> <li>• Selection of media assets</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies user needs of the website.</li> <li>• Designs website according to specifications.</li> </ul>	<b>2</b>
	<b>14.2 Uses HTML basics.</b>	<ul style="list-style-type: none"> <li>• Difference between hypertext and normal text.</li> <li>• Features of HTML</li> <li>• HTML document structure – Head, Title, body</li> <li>• HTML basics <ul style="list-style-type: none"> <li>○ Line and paragraph breaks</li> <li>○ Text: format and color</li> <li>○ Insertion of images</li> <li>○ Use of hyperlinks</li> <li>○ Lists</li> <li>○ Tables</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Explains the use of basic tags in HTML.</li> <li>• Creates web pages using HTML.</li> </ul>	<b>3</b>

Competency	Competency Level	Content	Learning outcome	Periods
	<b>14.3 Develops web sites using web development tools</b>	<ul style="list-style-type: none"> <li>• Web authoring tools</li> <li>• Text Formatting</li> <li>• Page Layout</li> <li>• Use of Multimedia building blocks: text, graphics, audio and video</li> <li>• Hyperlinks</li> <li>• Methods of web development               <ul style="list-style-type: none"> <li>○ Static vs dynamic webs</li> <li>○ Content managed web development</li> </ul> </li> <li>• Content Management Systems (CMS)               <ul style="list-style-type: none"> <li>○ The purpose of the process of CMS based web development:</li> <li>○ Work-flow and roles in CMS</li> <li>○ Content creation, editing, publishing, and use</li> <li>○ Roles: Creator, editor, publisher, administrator, user</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Uses web authoring tools to develop websites.</li> <li>• Explains the purpose and the process of content managed websites.</li> <li>• Uses CMS tools to create and manage websites.</li> </ul>	5

Competency	Competency Level	Content	Learning outcome	Periods
	<b>14.4 Demonstrates preparedness to publish web sites</b>	<ul style="list-style-type: none"> <li>• Internet Service Providers for Web hosting:</li> <li>• Maintenance of a website</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies requirements of web publishing.</li> <li>• Publishes on free hosts.</li> </ul>	1
<b>15. Compares and contrasts benefits and issues related to ICT in society</b>	<b>15.1. Investigates the contribution of ICT to the health sector</b>	<ul style="list-style-type: none"> <li>• ICT in Health services <ul style="list-style-type: none"> <li>○ Tele Medicine</li> <li>○ Tele monitoring</li> </ul> </li> <li>• Computer controlled medical equipment <ul style="list-style-type: none"> <li>○ Computer Axial Tomography (CAT) scanner</li> <li>○ Magnetic Resonance Imaging</li> </ul> </li> <li>• Maintenance of medical history records. <ul style="list-style-type: none"> <li>○ Clinical history</li> <li>○ Medication</li> </ul> </li> <li>• Test reports</li> </ul>	<ul style="list-style-type: none"> <li>• Describes the use of ICT in health services.</li> <li>• Describes the use of ICT based medical equipment.</li> <li>• Describes the use of ICT in medical records.</li> </ul>	2

Competency	Competency Level	Content	Learning outcome	Periods
	<b>15.2. Investigates the contribution of ICT to education</b>	<ul style="list-style-type: none"> <li>• ICT Assisted Learning (e-learning) <ul style="list-style-type: none"> <li>○ Interactive teaching and learning material</li> <li>○ Web-based learning</li> </ul> </li> <li>• Learning Management Systems (LMS)</li> <li>• School Management Information Systems</li> </ul>	<ul style="list-style-type: none"> <li>• Explains the use of ICT in interactive learning.</li> <li>• Describes the use of ICT in LMS.</li> <li>• Explains the use of ICT in school management.</li> </ul>	1
	<b>15.3. Investigates the contribution of ICT to agriculture</b>	<ul style="list-style-type: none"> <li>• Computer controlled agricultural equipment : Green houses</li> <li>• Information searching on agriculture</li> <li>• Virtual competitive market for agricultural products</li> <li>• Optimization of agricultural productivity</li> <li>• Detection and control of pests</li> <li>• Optimization of fertilizer use</li> <li>• Weather prediction</li> </ul>	<ul style="list-style-type: none"> <li>• Explains the use of ICT to enhance productivity in agriculture</li> <li>• Explains the use of ICT in dissemination of information in agriculture.</li> </ul>	1

Competency	Competency Level	Content	Learning outcome	Periods
	<b>15.4. Investigates the usage of ICT in different industries.</b>	<ul style="list-style-type: none"> <li>• Architecture: Computer-Aided Design(CAD)</li> <li>• Manufacturing - Computer Aided Manufacture (CAM)/Computerized machines in production</li> <li>• Production - Robotic</li> </ul>	<ul style="list-style-type: none"> <li>• Explains the use of ICT in engineering designs.</li> <li>• Explains the use of ICT in production.</li> </ul>	1
	<b>15.5. Explores the contribution of ICT to Business</b>	<ul style="list-style-type: none"> <li>• e-Business <ul style="list-style-type: none"> <li>○ Internet based (on-line) shopping</li> <li>○ Internet based (on-line) Share market transactions</li> <li>○ Safety measures</li> </ul> </li> <li>• Advertising</li> <li>• Outsourcing IT-Business Process (IT BPO)</li> </ul>	<ul style="list-style-type: none"> <li>• Explains the use of the Internet in business</li> <li>• Explains the use of ICT in advertising</li> <li>• Explains the use of the Internet in BPO.</li> </ul>	1
	<b>15.6 Explores the contribution of ICT to Entertainment</b>	<ul style="list-style-type: none"> <li>• Movies and cartoon production</li> <li>• Digital sound editing</li> <li>• Games</li> <li>• Simulations</li> </ul>	<ul style="list-style-type: none"> <li>• Describes the use of ICT in movie and game production.</li> <li>• Explains the use of ICT in audio editing.</li> </ul>	1

Competency	Competency Level	Content	Learning outcome	Periods
	<b>15.7. Assesses issues related to ICT with respect to ethical and legal aspects</b>	<ul style="list-style-type: none"> <li>• Legal Issues               <ul style="list-style-type: none"> <li>○ Data theft</li> <li>○ Unauthorized access to systems</li> </ul> </li> <li>• Intelligent property: copyright, patents and piracy.</li> <li>• Privacy</li> <li>• Forgery</li> <li>• ICT legislation framework in Sri Lanka</li> <li>• Ethical issues: Fair use, plagiarism</li> </ul>	<ul style="list-style-type: none"> <li>• Explains legal issues in the use of ICT</li> <li>• Explains ethical issues in the use of ICT</li> </ul>	1
	<b>15.8. Explores issues and precautions related to ICT infrastructure protection.</b>	<ul style="list-style-type: none"> <li>• Physical Security               <ul style="list-style-type: none"> <li>○ UPS</li> <li>○ Hardware firewalls</li> <li>○ Restricted access via door-locks</li> <li>○ CCTV surveillance</li> <li>○ Surge protectors</li> </ul> </li> <li>• Logical Security               <ul style="list-style-type: none"> <li>○ Passwords</li> <li>○ Software firewalls</li> <li>○ Backups</li> </ul> </li> </ul> <p>Protection against malware: spam, virus, key-loggers</p>	<ul style="list-style-type: none"> <li>• Identifies security issues.</li> <li>• Takes precautions to eliminate or minimize security threats.</li> </ul>	2

Competency	Competency Level	Content	Learning outcome	Periods
		<ul style="list-style-type: none"> <li>• Environmental factors               <ul style="list-style-type: none"> <li>○ Dust</li> <li>○ Humidity</li> <li>○ Temperature</li> </ul> </li> <li>• Institutions for information security of Sri Lanka</li> </ul>		
	<p><b>15.9. Investigates health and safety issues inherent in the use of ICT.</b></p>	<ul style="list-style-type: none"> <li>• Ergonomics and Health issues               <ul style="list-style-type: none"> <li>Repetitive Strain Injury: eye-strain, backaches</li> </ul> </li> <li>• E-waste: Hazardous elements and its impact on the environment.</li> <li>• Safe disposal and destruction of electronic equipment.</li> </ul>	<ul style="list-style-type: none"> <li>• Explains basic health and environmental issues associated with the use of computers.</li> <li>• Explains the precautions to be taken in the use of computers.</li> <li>• Explains safe disposal methods of electronic equipment.</li> </ul>	2
	<p><b>15.10. Assesses issues associated with ICT and society.</b></p>	<ul style="list-style-type: none"> <li>• Digital divide</li> <li>• Digital bridge</li> <li>• De-skilling</li> <li>• Techno-rich employment</li> <li>• Equal Opportunities</li> <li>• Misuse of ICT and precautions to be taken (social media)</li> </ul>	<ul style="list-style-type: none"> <li>• Explains problems caused by ICT in society</li> <li>• Explains changes in employment caused by advances in ICT</li> </ul>	1
Total (Periods)				90

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## Instructions for the learning-teaching process

### General Instructions for the teaching learning process of program design

#### **Competency: 10. Writes programs to solve problems**

The competency expected from students is to identify a simple problem, design the solution, document the solution using standard tools and to test the same using a programming language. Development of a software application is not expected here. The aim is to inculcate a programming discipline in students so that they would be better equipped to become developers in the future, as this endeavor builds core competencies required by a programmer.

Students should not be directed to write programs using a programming language as solutions to problems straight away. First they should identify the problem and design the algorithm. This algorithm should finally be in pseudo code. That pseudo code should be used to code the solution in a computer language and to execute the same with suitable test data to verify the solution.

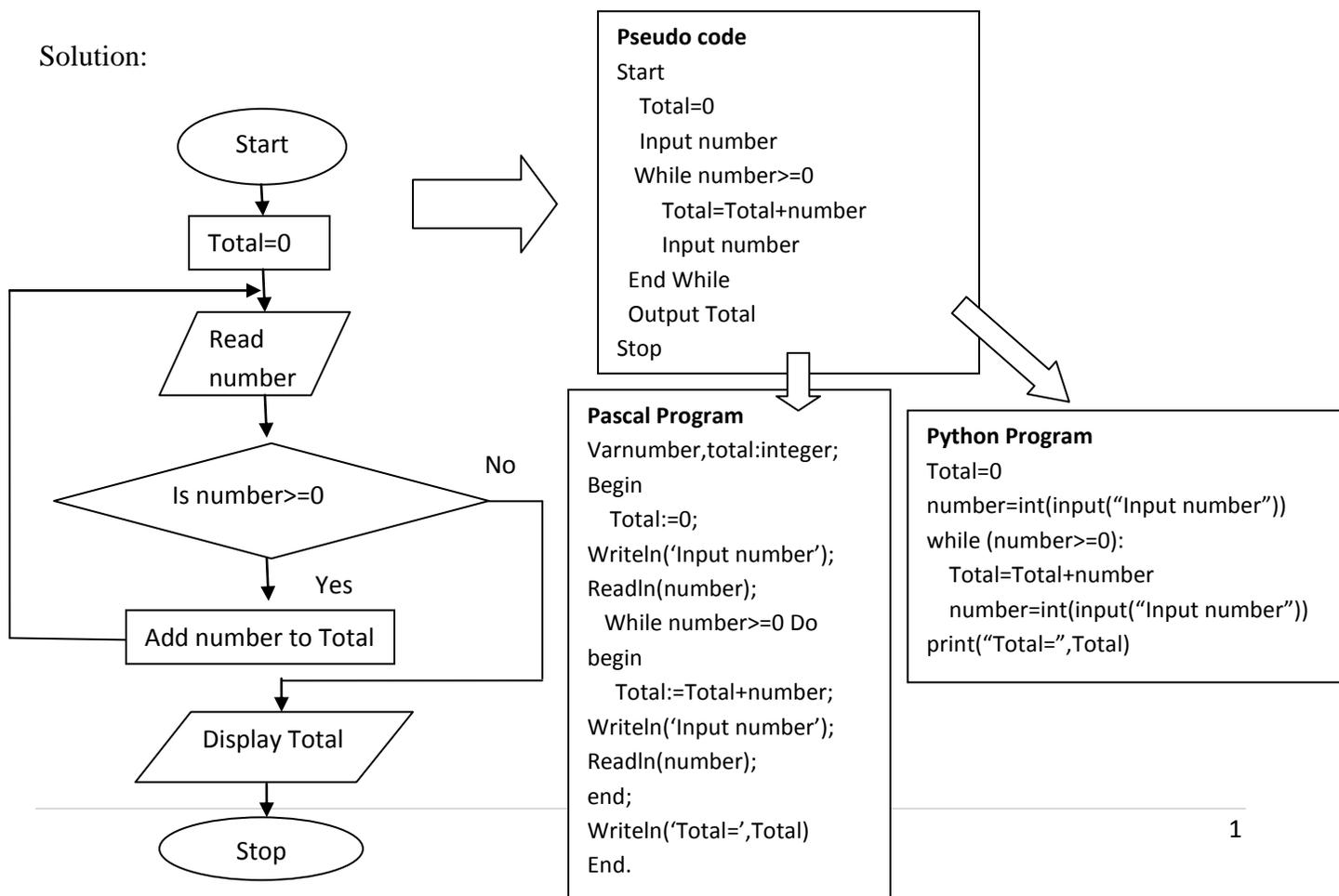
Simple examples may be used straight away to explain the syntax and vocabulary of the language but ultimately students should be directed through the process of identification of the problem, to design the algorithm and implement the same using a programming language. Students should type the program using the pseudo code.

#### **Following is an example.**

Problem:

Write a computer program to receive a set of positive numbers from a user and return the total of the integers. Input of numbers will end when the user inputs a negative value.

Solution:



The following is a suggestion for the teaching learning process to develop competencies in students.

1. Select day-to-day life problems for which solutions involve which involve sequence, selection and iterations.
2. Discuss solutions and help students draw flow charts to document the solutions.
3. Help students to write the corresponding pseudo codes
4. Once students are comfortable with control structures, the teacher can move on to the discussion of problems that can be modeled mathematically.
5. Use pseudo codes to write computer programs.
6. Only step (5) needs access to computers.
7. When discussing problems start from sequence, then move on to selection and finally to iteration.

## **Comparison of the use of Pascal with Python as a Teaching Language of Programming**

Those who prefer to use Python over Pascal please note the following arguments and use them in your teaching with necessary precautions to avoid any undesirable effect on students

Pascal itself is a teaching language whereas Python has been developed with a developer in mind. Being a developer's language, numerous short cuts, flexible data structures and easy control structures which could have if not a negative but undesirable effect on a beginner programmer are present in Python. In the syllabus, data types are stressed and Pascal honors strict data typing of variables whereas in Python variables can be used without such declaration. Further, variables have to be declared prior to use in Pascal but in Python variables can be used without declaration. If a student uses a variable "marks" early in a program and mistakenly types "mark" to refer to the same variable, which is an error, this error will not be reflected in Python, but in Pascal this error is indicated. On the other hand as Python is case sensitive, variable "marks" and "Marks" are treated as two variables, which is not helpful to a novice programmer. Pascal uses more concrete "begin ... end" delimiters to grouping of compound statements whereas Python uses indentation, which is relatively abstract. Since education psychology advises not to start with abstract concepts in teaching, the above difference is significant. The "for x=1 to 10" type of structure in pseudo code can be directly implemented in Pascal but in Python it is "for x in range(1,10)" and the range actually is 1 to 9 (not 1 to 10) which could confuse students. Both in pseudo code and Pascal "If ....then..else" is similarly used whereas in Python instead of "then" ":" is used, which is relatively abstract again.

Indenting statements both in pseudo code and programming is advised and encouraged as it improves readability and maintainability of codes. Pascal does not impose such a rule whereas Python enforces it in its coding but at a penalty of returning a syntax error message if not adhered to. Moving between indentations adds an unnecessary overhead on beginner programmers, particularly in locating syntax errors.

**Competency Level:** 10.1 Analyzes the problem

**Time:** Two periods

**Learning Outcome:**

- Identifies inputs and outputs
- Explores solution space

**Content:**

- Identification of inputs and outputs
- Identification of possible alternate process steps

**Concepts and terms that need to be highlighted:**

- Input, process and output.
- Need for variables to store data.
- There are several solutions possible for the same problem.
- Deciding on the best solution.

**Guidance for lesson plans:**

1. Select simple problems from day-to-day life.
2. Ensure that students understand the problem well.
3. Instruct them to write down the solution in their own way.
4. Identify inputs, process steps and outputs.
5. Instruct them to present the solutions.
6. Select the best solution.
7. Repeat steps (2)-(6) for simple problems for which there are solutions that can be mathematically modeled.
8. Select problems, solutions for which will not exceed 5 or 6 steps.

**Guidance for assessment and evaluation**

1. Provide several problems, both mathematically modeled and general
2. Instruct students to identify inputs, process steps and outputs.
3. Instruct them to design and document the solution as they think best.

**Quality inputs**

- <http://interactivepython.org/runestone/static/pythonds/AlgorithmAnalysis/analysis.html>
- [http://www.academia.edu/7135142/Chapter\\_1\\_An\\_Overview\\_of\\_Computers\\_and\\_Programming\\_Languages](http://www.academia.edu/7135142/Chapter_1_An_Overview_of_Computers_and_Programming_Languages)
- <https://www.youtube.com/watch?v=6hfOvs8pY1k>

**Competency Level 10.2** Uses control structures in developing algorithms to solve problems

**Time:** Two periods

**Learning Outcome:**

- Explains purpose of algorithms
- Describes control structures
- Applies control structures to develop algorithms

**Content:**

- Introduction to algorithms: purpose
- Control structures for developing algorithms
  - Sequence
  - Selection
  - Repetition (Repetition)

**Concepts and terms that need to be highlighted:**

Algorithm, sequence, selection and iteration, Boolean conditions

**Guidance for lesson planning:**

1. Explain the term algorithm clearly with examples.
2. Discuss examples of processes involving sequence.
3. Discuss examples of processes involving single selection,
  - a. where condition for selection is Boolean (either direct or resulting from an arithmetical operation)
  - b. where it is not essential to have an alternative if a condition is false.
4. Discuss examples of processes involving iteration
  - a. Two categories of conditions used for repetitive processes: repeat while a condition is true and repeat until a condition is true.
  - b. Explain the Difference between the two repetitive process
  - c. Find real life examples as well as mathematical examples.

**Guidance for assessment and evaluation:**

1. Provide problems involving sequence only, sequence and selection , selection and iteration.
2. Provide non-mathematical and mathematical problems (eg. Grade 10 mathematical problems), solutions for which do not exceed 5-6 steps pseudo code

**Quality inputs**

<https://www.youtube.com/watch?v=WENn8IOfp4M>

<https://www.youtube.com/watch?v=z-bjjdV9WwA>

<https://www.youtube.com/watch?v=qh2adyweyCQ>

## **Competency Level**10.3 Uses Different Tools to Present Algorithms

**Time:** Four periods

### **Learning Outcomes:**

- Identifies symbols of flow charts
- Explains structure of pseudo code
- Draws flow charts to represent algorithms
- Converts flow charts to pseudo code

### **Content:**

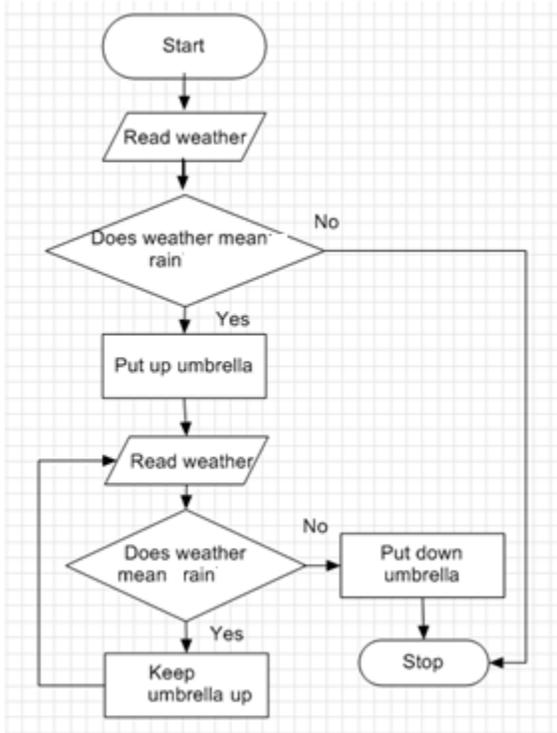
- Tools for developing algorithms
  - Flow charts
  - Pseudo codes
  - Conversion of flowcharts into pseudo codes

### **Concepts and terms that need to be highlighted:**

- Use of standard symbols to construct flow charts
- Avoiding confusion of processes with input or output
- Differentiation in the selection and iteration in flow charts

### **Guidance for lesson planning:**

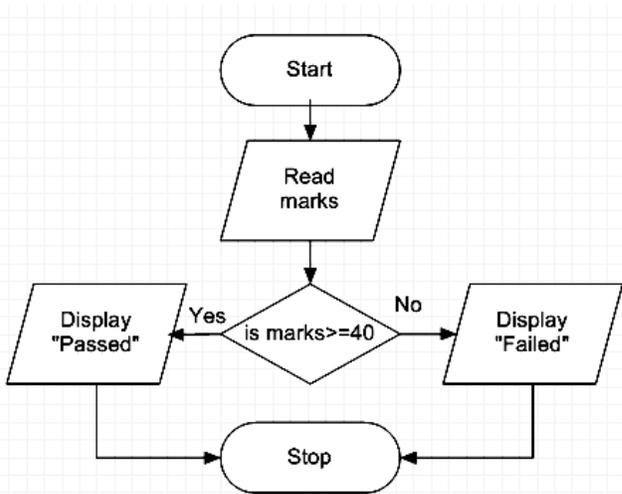
1. Start with solutions documented informally by the students.
2. Help them to convert the solutions into formal documents using flow charts.
3. First select simple non mathematical examples to explain the use of flow charts to document control structures.
4. Then, select simple mathematical examples.
5. Demonstrate how to construct flow charts to document solutions to problems
6. In the conversion of flow charts into pseudo codes the order of activities to be followed is given below.
  - a. sequence
  - b. sequence and selection
  - c. sequence and iteration and sequence
  - d. iteration and selection
7. Explain how to identify a selection and write the pseudo code accordingly.
8. Explain how to identify iteration and write the pseudo code accordingly.
9. Stress the use of start-stop, if- endif and while-endwhile.
10. Stress indentation of steps within control structures.
11. Provide numerous flow charts to be converted into pseudo codes as practice exercises.
12. Following are some examples



Pseudo code:

```

Start
  Read weather
  If weather=rain then
    Put up umbrella
    Read weather
    While weather=rain
      Keep up umbrella
      Read weather
    Endwhile
    Put down umbrella
  Endif
Stop
  
```



Pseudo code

```

Start
  Read marks
  If marks >= 40 then
    Display "Passed"
  Else
    Display "Failed"
  Endif
Stop
  
```

## **Guidance for assessment and evaluation:**

### **Part 1:**

1. Provide problems of increasing difficulty (eg. Mathematical problems of Grade 10 Math).
2. First provide flow charts with items missing to be completed meaningfully.  
(Label the missing items and request to identify them)
3. Next provide problems to be solved.
4. Instruct students to build flow charts to explain solutions.
5. Check whether standards are maintained.
6. Instruct them to convert flow charts into pseudo code.

### **Part 2:**

1. Provide students with flow charts prepared by the teacher.
2. Instruct students to convert them into pseudo code.

### **Quality Inputs:**

- <https://www.lucidchart.com/pages/what-is-a-flowchart-tutorial>
- [http://www.rff.com/flowchart\\_samples.htm](http://www.rff.com/flowchart_samples.htm)
- <http://www.edrawsoft.com/Flowchart-tutorial.php>
- [http://www.ehow.com/how\\_5962413\\_convert-flowcharts-pseudocode.html](http://www.ehow.com/how_5962413_convert-flowcharts-pseudocode.html)

**Competency Levels:****10.4 Uses Data Types in Programming****10.5 Uses Operators in Programming****Time:** Eight periods**Learning Outcome:**

- Declares identifiers using correct data types
- Uses variables effectively in programs
- Selects correct operators for computations
- Applies operators effectively in programs
- Evaluate results of expressions

**Content:**

- Identifiers, reserved words and keywords in a computer programming language
- Variables and constants in computer programming
- Description of data types
  - Purpose of data types, Use of meaningful names for identifiers
  - Basic Data Types: Logical, Numeric, Integer, Float, Character (String)
- Purpose of operators
  - Basic operators: Arithmetic operators, Comparison operators, Logical operators: AND, OR, NOT
- Operator precedence, Expressions

**Concepts and terms that need to be highlighted:**

- The difference between key words and reserved words.
- The use of meaningful terms for user-defined identifiers
- Selection of suitable data types based on logical explanations or application domain.
- Variables as placeholders in Random Access Memory for values
- Declaration of variables is a good practice to avoid possible errors.

**Guidance for lesson planning:**

1. Help student familiarize themselves with the interface (or the Integrated Development Environment) of the programming software.
2. Demonstrate the structure of a program of the selected programming language.
3. Demonstrate the use of data types in various contexts along with suitable examples
4. Provide practice exercises involving all the operators in detail
5. Provide problems involving mathematical and logical computations to be evaluated using a programming language.
6. Instruct students to evaluate mathematical and logical expressions without writing programs.

**Guidance for assessment and evaluation:**

Provide students with problems involving mathematical and logical calculations to be evaluated using a programming language.

**Quality inputs:**

- [http://wiki.freepascal.org/Variables\\_and\\_Data\\_Types](http://wiki.freepascal.org/Variables_and_Data_Types)
- [http://www.tutorialspoint.com/pascal/pascal\\_operators.htm](http://www.tutorialspoint.com/pascal/pascal_operators.htm)
- <http://pjhayward.net/pascal/lesson3.php>

## **Competency Level-10.6 Develops programs involving selection control structure**

**Time:** Five periods

### **Learning Outcome:**

- Identifies correct selection control structure.
- Identifies correct selection condition.
- Uses selection control structure in programs.
- Combines selection control structures to meet programming needs.

### **Content:**

- IF-EndIf and If-Else-EndIf statement
- Use of switch/case when single variable has multiple conditions
- Conversion of flow charts into pseudo codes and subsequent coding into a programming language

### **Concepts and terms that need to be highlighted:**

- Significance of indentation in coding algorithms.
- Simplification of pseudo codes in complex selections using switch/case construct.
- Ability to understand error messages given by the language compiler.
- Use of suitable test data to verify the logical correctness of the programs.

### **Guidance for lesson planning:**

1. Do not use nested structures at the beginning but once students are familiar with simple selection structures teacher may move on to nested selection structures.
2. Explain how to code selection control structures using programming language.
3. Demonstrate how to code a pseudo coded solution using programming language.
4. Provide teacher designed pseudo codes for students to code using a programming language.
5. Provide students with simple, suitable problems to design solutions using flow charts and then instruct them to convert flow charts into pseudo code.
6. Instruct students to test the pseudo coded solutions with a programming language.

### **Guidance for assessment and evaluation:**

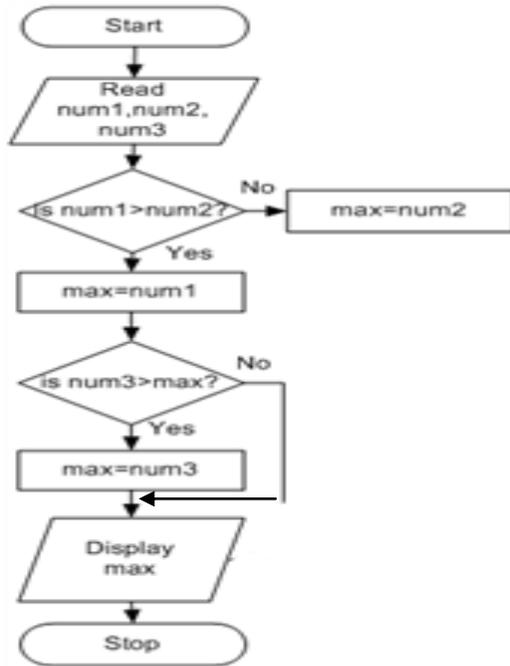
- Provide students with computable problems.
- Instruct them to provide solutions for the same using pseudo code.
- Instruct students to code the pseudo codes using a programming language to confirm the solutions using test data.

### **Quality inputs:**

- [http://www.tutorialspoint.com/pascal/pascal\\_if\\_then\\_else\\_statement.htm](http://www.tutorialspoint.com/pascal/pascal_if_then_else_statement.htm)
- <https://www.youtube.com/watch?v=IJcvJmY0dl0>
- <https://www.youtube.com/watch?v=41uoA9PvV1k>

### Example for a simple selection solution.

Construct a program to find the maximum value of three user input numbers.



Pseudo code:

```
start
read num1, num2, num3
if num1>num2 then
    max=num1
else
    max=num2
end if
if num3>max then
    max=num3
end if
display max
stop
```

Pascal code:

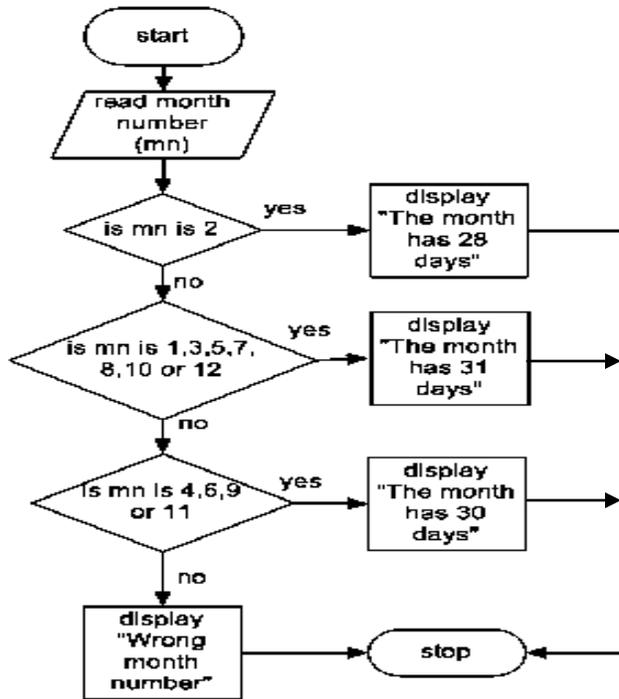
```
var num1,num2,num3,max:integer;
begin
    writeln('Input num1');
    readln(num1);
    writeln('Input num2');
    readln(num2);
    writeln('Input num3');
    readln(num3);
    if num1>num2 then
        max=num1
    else
        max=num2;
    if num3>max then
        max=num3;
    writeln('max=',max)
end
```

python code:

```
num1=int(input('Input num1'))
num2=int(input('Input num2'))
num3=int(input('Input num3'))
if (num1>num2 ):
    max=num1
else:
    max=num2
if num3>max:
    max=num3
print('max=',max)
```

**Example for nested selection solution involving combined conditions.**

Write a program to receive month number and output the number of days that month has. Do not consider a leap year first but help students modify the program to consider that also.



Pseudo code

```

start
input month number into nm
if mn=2 then
  write "The month has 28 days"
else if mn=1 or 3 or 5 or 7 or 8 or 10 or 12 then
  write "The month has 31 days"
else if mn=4 or 6 or 9 or 11 then
  write "The month has 30 days"
else write "Wrong month number"
end if
stop
  
```

Pascal code

```

Var mn:integer;
begin
  writeln('input month number');
  readln(mn);
  case mn of
    2: writeln('The month has 28 days');
    1,3,5,7,8,10,12: writeln('The month has 31 days');
    4,6,9,11: writeln('The month has 30 days');
    else writeln('Wrong month number');
  end;
end.
  
```

Python code

```

mn=int(input("input month number"))
if (mn==2):
  print("The month has 28 days")
elif (mn==1 or mn==3 or mn==5 or mn==7 or mn==8 or mn==10 or mn==12):
  print("The month has 31 days")
elif (mn==4 or mn==6 or mn==9 or mn==11):
  print("The month has 30 days")
else:
  print("Wrong month number")
  
```

**Competency Level:**10.7 Develops programs involving basic iterations

**Time:** Seven periods

**Learning Outcome:**

- Identifies correct iteration structure.
- Applies correct condition to control iterations.
- Uses iteration control structure in programs.

**Content:**

- Use of iterations (repetitions) in:
  - Cases where the number of iterations are known
  - Cases where the number of iterations are unknown
- Checking of the condition for iterations
  - Beginning of the iteration
  - End of the iteration
- Conversion of flow charts into pseudo codes and subsequent coding using a programming language

**Concepts and terms that need to be highlighted:**

- A repetition (or an iteration) constructed using while/endwhile requires a condition to be true to maintain the iteration.
- A repetition (or an iteration) constructed using repeat/until requires a condition to be false to maintain the iteration.
- Iteration will terminate either after a known number of times of operation or when the condition is made false in the case of while/endwhile or true in the case of repeat/until by an action within the iteration.
- Minimum number of times of an iteration: Depending on the verification of condition either beginning or end of the iteration.
- repeat/until body is executed at least once, execution of while/endwhile depends on the condition to be true:one or zero times
- For...EndFor structure could be used to build known number of iterations.

**Guidance for lesson planning:**

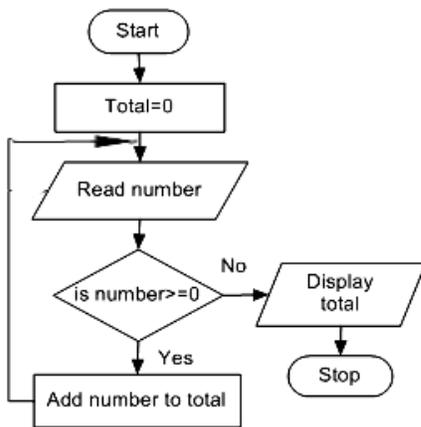
1. Do not use nested structures at the beginning but once students are familiar with simple iterations teacher may move on to nested iteration structures.
2. Explain how to code iteration control structures using programming language.
3. Demonstrate how to code a pseudo coded solution using programming language.
4. Provide teacher designed pseudo codes for students to code using a programming language.
5. Provide students with simple, suitable problems to design solutions using flow charts and then instruct them to convert flow charts into pseudo code.
6. Instruct students to test the pseudo coded solutions with a programming language.
7. First use the construct “For” and thereafter move on to use “While/EndWhile”.

## Guidance for assessment and evaluation

1. Provide students with computable problems without nested control structures
2. Start with problems for solutions which involve a known number of repetitions and move on to unknown number of repetitions.
3. Instruct them to provide solutions for same using pseudo code.
4. Instruct students to code the pseudo codes using a programming language to confirm the solutions using test data.

Example:1 This involves simple iteration only.

Problem: Develop a computer based solution to receive a set of positive numbers or 0 from user and display the total value. Data input will stop when a negative value is entered.



Pseudo code:

```
start
total=0
input number
while number>=0
    total=total+number
    input number
endwhile
output total
stop
```

Pascal code

```
var number,total:integer;
begin
total:=0;
writeln('Input Number');
readln('number');
while number>=0 do
begin
total:=total+number;
writeln('Input Number');
readln('number');
end;
writeln('total=',total);
end.
```

python code

```
total=0
number=int(input('Input Number'))
while (number>=0):
total=total+number
number=int(input('Input Number'))
print ("Total=",total)
```

### Quality Inputs

- <https://www.youtube.com/watch?v=A2ummLkXUGg>
- [https://www.youtube.com/watch?v=lRRRqb6Yg\\_w](https://www.youtube.com/watch?v=lRRRqb6Yg_w)
- <https://www.youtube.com/watch?v=hFaqLPmbZUo>

## 10.8 Develops programs with nested control structures

**Time:** Three periods

### **Learning Outcome:**

- Identifies cases where nested structures are required
- Uses nested structures in programs

### **Content:**

- The purpose of using nested control structures
- Use of control structures within another control structure
  - Selection within selection
  - Iteration within iteration
  - Iteration within selection
  - Selection within iteration
- Conversion of flowcharts into pseudo codes and subsequent coding into a programming language

### **Concepts and terms that need to be highlighted:**

- The explanation of the term “Nested”
- Nesting of similar control structures
- Nesting of different control structures

### **Guidance for lesson planning:**

1. Start with nested selection structures
2. Then discuss selections nested in iterations
3. Then discuss iterations nested in selections
4. Do not let the number of statements in compound statements exceed four
5. First algorithms then test with a programming language

### **Guidance for assessment and evaluation**

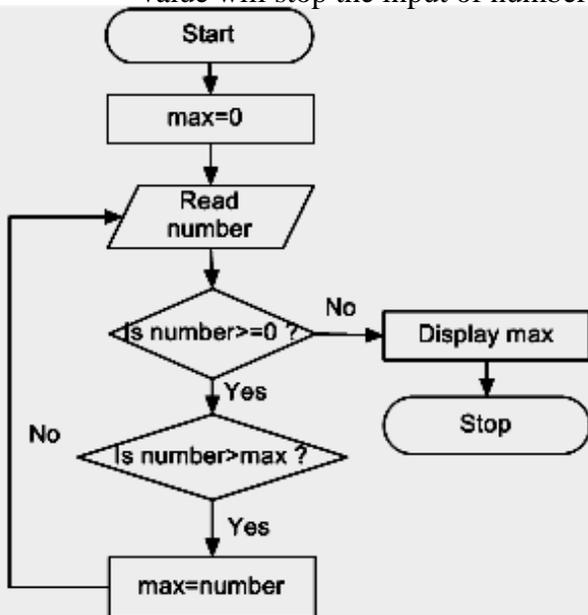
1. Provides students with simple problems, solutions for which involve nested structures
2. Test their algorithms
3. Ask them to produce relevant computer programs.

### **Quality inputs**

- <http://pascal-programming.info/lesson4.php>
- [https://cs.nyu.edu/courses/spring99/A22.0002.002/lecture\\_notes/lecture7.pdf](https://cs.nyu.edu/courses/spring99/A22.0002.002/lecture_notes/lecture7.pdf)
- <https://www.youtube.com/watch?v=L7M9Kce1LRA>

**The following is an example.**

Problem: Develop a computer based solution to receive a set of positive numbers or 0 from user and display the maximum value. Input of negative value will stop the input of numbers.



pseudo code:

```
start
max=0
read number
while number>=0
    if number>max then
        max=number
    end if
    read number
end while
display max
stop
```

python code:

```
max:=0
number=int(input("Input number"))
while (number>=0):
    if (number>max):
        max=number
    number=int(input("Input number"))
print('max=',max)
```

Pascal code:

```
Var max,number: real;
begin
    max:=0
    writeln('Input number');
    readln(number);
    while number>=0 do
    begin
        if number>max then
            max:=number;
        readln(number)
    end;
    writeln('max=',max);
end.
```

**Competency Level:10.9 Develops programs using one dimensional arrays**

**Time:** Three periods

**Learning Outcome:**

- Describes features of one dimensional arrays
- Carries out operations in arrays
- Uses one dimensional arrays in programs

**Content:**

- The purpose of the use of arrays
- Definition of the one dimensional array
- Properties of an array
  - Index
  - Contiguous locations
  - Random access
- Array Operations
  - Declaration
  - Accessing values
  - Assignment of values

**Concepts and terms that need to be highlighted:**

- Size, dimension and data type of an array
- Address (index) of an element of an array

**Guidance for lesson planning:**

1. Find a physical arrangement of items as an example of an array: Egg container
2. Explain array operations: reading from, insertion
3. Use a programming language to demonstrate the use of arrays in programs
4. Provide simple exercises on arrays

**Guidance for assessment and evaluation**

1. Provide a problem involving use of arrays
2. Instruct students to write pseudo code to work out the solution
3. Instruct them to implement the solution using a programming language

**Quality Inputs**

- <http://pascal-programming.info/lesson10.php>
- [http://www.tutorialspoint.com/pascal/pascal\\_arrays.htm](http://www.tutorialspoint.com/pascal/pascal_arrays.htm)
- <https://www.youtube.com/watch?v=sv1GZnCx-PM>
- <https://www.youtube.com/watch?v=E2dzP4V399Y>

## **Competency Level: 10.10 Structures programs through the use of subprograms**

**Time: Two periods**

### **Learning Outcome:**

- Describes the need of sub-programs
- Demonstrates use of value-returning and value-not returning sub-programs
- Uses sub-programs in programming

### **Content:**

- The purpose of the use of subprograms
  - Improvement of code reusability
  - Easy to test
  - Readability
  - Maintainability
- Types of subprograms: returning of values and not returning of values
- Structuring of programs using subprograms
- Developing a simple programs with a single subprogram

### **Concepts and terms that need to be highlighted:**

- Modular approach to program design
- Advantages of modular approach
- Global and local variables
- Provide different terms used for subprograms (function, routine, procedure, method etc.)

### **Guidance for lesson planning:**

1. Explain the significance of breaking a big program into modules
2. Provide a longer algorithm which could be structured into modules and let students identify codes being reused
3. Let them define repeating codes as a sub-program
4. Demonstrate how to call them into the main program.
5. Test the new algorithm using a programming language
6. Provide a simple problem, solutions for-which involves sub-programs
7. Guide them to design an algorithm using sub-programs
8. Let them try out with a programming language

### **Guidance for assessment and evaluation:**

1. Provide a simple problem solutions for which involves sub-programs
2. Instruct them to design the algorithm using sub-programs
3. Let them try out with a programming language
4. Describe the terms used for the same concept

### **Quality Inputs:**

- <http://pascal-programming.info/lesson7.php>
- <http://www.freepascal.org/docs-html/ref/refch14.html>
- <https://www.youtube.com/watch?v=eQh37zBWEqM>

## **Competency Level: 10.11 Explores the evolution of programming languages**

### **Time: Two periods**

### **Learning Outcomes:**

- Compares and contrasts low-level and high-level languages
- Describes features of high-level languages
- Describes the operation of language translators

### **Content:**

- Low-level languages
  - Machine language
  - Assembly language
- High-level languages
- Types of high-level languages:
  - Procedural vs Declarative
  - Structured vs Object oriented
  - Programming vs scripting
- Mechanism(tools) used to convert source code to machine code
  - Interpreters
  - Compilers
- Testing and Debugging

### **Concepts and terms that need to be highlighted:**

- As per the current situation it is difficult to categorise programming languages using a simple criteria
- Old version: Generations of languages
- Need of language translators
- Compile time (syntax) and run time errors

### **Guidance for lesson planning:**

1. Start with older version of language generations
2. Explain the difficulty in finding a simple criteria to classify languages
3. Explain the types of languages with examples
4. Explain the types of language translators
5. Demonstrate with several languages
6. Explain compile-time and run-time errors
7. Demonstrate the types of errors using a programming language

### **Guidance for assessment and evaluation:**

1. Provide exercises to group languages using several criteria.
2. Instruct to elaborate with examples

### **Quality inputs:**

- [http://cdn.oreillystatic.com/news/graphics/prog\\_lang\\_poster.pdf](http://cdn.oreillystatic.com/news/graphics/prog_lang_poster.pdf)
- [http://cs.brown.edu/~adf/programming\\_languages.html](http://cs.brown.edu/~adf/programming_languages.html)
- <http://users.encs.concordia.ca/~grogono/CourseNotes/epl.pdf>
- <http://users.encs.concordia.ca/~grogono/CourseNotes/epl.pdf>
- <http://www.pasteur.fr/formation/infobio/python/ch05s02.html>

## **Competency; 11. Explores the process of information system development**

### **Competency Level: 11.1 Describes the concept of information system**

#### **Time: Four periods**

#### **Learning Outcome:**

- Describes an information system
- Identifies the relationship among components of an information system
- Explains the significance of an information system

#### **Content:**

- Definition of a system
- Components of a system
  - Input
  - Process
  - Output
- Manual systems
- Computer based systems
- Information systems
  - Importance of Information in decision making
  - Inputs, outputs, data-flows and processes

#### **Concepts and terms that need to be highlighted:**

- System and its boundaries
- Inter-relation among components
- Inputs, processing and outputs

#### **Guidance for lesson planning:**

1. Explain natural systems in terms of boundary, inputs, processes and outputs.
2. Then move on to discuss information systems
3. Use examples like library, attendance registry
4. Explain the application of ICT to develop information systems.

#### **Guidance for assessment and evaluation:**

1. Provide a example of an information system
2. Instruct students to identify inputs, processes and outputs

#### **Quality inputs:**

- <https://www.youtube.com/watch?v=Qujsd4vkqFI>
- <https://www.youtube.com/watch?v=Y3zoHFdzQbs>
- <https://www.youtube.com/watch?v=0CtHixFhXOE>
- <https://www.youtube.com/watch?v=593SYDzCUXg>

**Competency Level: 11.2 Explains the System Development life cycle**

**Time: Two periods**

**Learning Outcome:**

- Describes the steps in system development
- Provides examples of each step.

**Content:**

- The system development life-cycle
  - Identification of requirements
  - Design of the solution
  - Implementation of the solution
  - Testing and Debugging of the solution
  - Deployment of the solution
  - Maintenance of the system.
- Difference between phased system development life-cycle and iterative increment life-cycle

**Concepts and terms that need to be highlighted:**

- Feasibilities: Economic, Technical and Operational
- Need of the analysis to identify requirements
- Analysis tools
- Software development as the implementation of the solution
- Deployment of the system for the use in real environment

**Guidance for lesson planning:**

1. Select an information system closer to students such as Library Information System
2. Guide the students through the development process to explain each stage of the systems development

**Guidance for assessment and evaluation:**

1. Provide an example that involves development of an information system
2. Instruct students to list tasks in each stage with reference to the example.

**Quality inputs:**

- <https://www.youtube.com/watch?v=mH-Nc5kvyQQ>
- <https://www.youtube.com/watch?v=j6rxyRwEdVU>
- [http://oer.nios.ac.in/wiki/index.php/Phases\\_of\\_System\\_Development\\_Life\\_Cycle](http://oer.nios.ac.in/wiki/index.php/Phases_of_System_Development_Life_Cycle)

**Competency: 12. Uses the Internet for effective information search and communication effectively**

**Competency level: 12.1 Uses the Internet to access information**

**Time:**Four periods

**Learning Outcome:**

- Describes the operation of the Internet.
- Explains the services of the Internet
- Use the services to obtain information

**Content:**

- Introduction to the Internet: URL, IP address and domain names.
- Client-server operation: Bi-directional information flow between browser and the server
- Functions of the Internet: E-mail, WWW, ftp, remote access, file-sharing, streaming of media, cloud computing, search engines.
- Domain name server and its purpose

**Concepts and terms that need to be highlighted:**

- Brief discussion of the Internet and its environment
  - URL -identify on the Internet.
  - IP address - generally shown as 4 octets of numbers from 0-255 represented in decimal form instead of binary form. (mention the difference In IP v6 )
  - Domain names - consist of a unique combination of letters, numbers, and hyphens.
- Identify operations of the Internet and the client-server architecture
- Explanation of their functions/services

**Guidance for lesson planning:**

1. Describe the URL, IP address and domain names
2. Search and identify using computer/Internet
3. Discussion of the operation of the Internet using video clips, pictures and diagrams: Client-server architecture
4. Function such as e-mail, browsing, upload, download
5. Demonstrate and describe search and remote access WWW, ftp, file-sharing, cloud computing

**Guidance for assessment and evaluation:**

1. Subject relative searching through the Internet
2. Find out the URL of given web site (www.schoolnet.lk)
3. List the URL of given subjects

**Quality Inputs:**

- [https://www.youtube.com/watch?v=Jj6EHgSsx\\_U](https://www.youtube.com/watch?v=Jj6EHgSsx_U)
- <https://www.youtube.com/watch?v=oj7A2YDgIWE>
- <https://www.youtube.com/watch?v=72snZctFFtA>
- <http://computer.howstuffworks.com/internet/basics/internet.htm>

**Competency level:** 12.2 Uses the Internet for communication

**Time:** Five periods

**Learning Outcome:**

- Communicates via e-mail accounts.
- Describes basic communication facilities available in the Internet.

**Content:**

- e-mail account
  - Sending and receiving mails: cc and bcc
  - Using attachments
- Instant messaging services
- Video-based communication
- Social media networking

**Concepts and terms that need to be highlighted**

- Brief discussion of e-mail accounts and communication through the Internet
- Demonstrate and Describe using e-mail
  - sending
  - receiving
  - attachment
- Explore the video-based communication and social media communication (chatting and video conferencing )

**Guidance for lesson planning:**

1. Demonstrate and Describe using e-mail sending, receiving, attachment, bcc and cc
2. Using instant messaging services such as text chat
3. Describe video based communication and social media networking and blogs
4. Describe the constructive usage and destructive usages of social media

**Guidance for assessment and evaluation:**

1. Using e-mail
2. Explore instant message services
3. List social media networks
4. Search and build simple blogs (e.g. word-press)

**Quality inputs:**

- <https://www.youtube.com/watch?v=p6MK3rS4PqE>
- <https://www.youtube.com/watch?v=mObXubaaNj4>
- <http://computer.howstuffworks.com/e-mail-messaging/email.htm>

**Competency: 13. Develops Multimedia contents to express ideas effectively.**

**Competency Level: 13.1 Creates effective still graphics using suitable graphic software.**

**Time: Four periods**

**Learning Outcome:**

- Describes properties of digital still images.
- Creates images using software tools
- Edit digital graphics.
- Uses basic text effects.

**Content:**

- Digital image elements: pixel, resolution, size, color
- Image capacity and compression: lossy formats and lossless formats
- Graphic types: raster and vector
- Image file formats, extensions and classifications
- Working knowledge of graphic software to perform the following basic operations: Open, save and edit, Importing images, Sizing and transformation, Selections, cut, crop, replace, Working with layers, Text editing and effects, color
- Working knowledge of graphic software to perform following basic operations

**Concepts and terms that need to be highlighted:**

- Describes properties of digital still images.
- Creates images using software tools
- Processes images using software tools

**Guidance for lesson planning:**

1. Explain the theoretical aspects of digital images
2. Demonstrate how to use a graphic software: basic tools
3. Provide exercises that require basic image editing tools

**Guidance for assessment and evaluation:**

1. Provide an already developed image
2. Let students to recreate the developed image using a graphic software

**Quality inputs:**

- <https://www.youtube.com/watch?v=8LmW5ndnEqw>
- <https://www.youtube.com/watch?v=P143GdVeMjE>
- <https://www.youtube.com/watch?v=8S0V6RqMZjs>
- <https://www.youtube.com/watch?v=Jle81ofRLok>

**Competency level:** 13.2 Creates effective 2D animations using a suitable 2D animations software

**Time:** Four periods

**Learning Outcome:**

- Describes basic features of 2D animations
- Creates simple and basic animations using animation software tools

**Content**

- Animation basics: Layers, frames, timing, frame rate
- Geometrical objects and shapes
- Frame types: frame, key frame, initial frame, destination frame, blank key frame.
- Animations
  - Frame by frame animation
  - Basic Tweening
- Publishing

**Concepts and terms that need to be highlighted**

- Special features of 2D animation software
  - Layers, Frames, Timing Frame rate
- Handling shapes and geometrical objects using drawing tools to create animation presentation
- Use various frame types to create animation presentation
- Use path, shape and colour animation
- Use frame by frame animation and publishing

**Guidance for lesson planning:**

1. Demonstrate basic drawing tools
  - a. Create shapes and objects
  - b. Apply colours
  - c. Modify shapes
2. Demonstrate timeline with different types of frames
3. Demonstrate single layer creations
4. Demonstrate shapes and geometrical objects and their deformations using animations
5. Prepare an animation using multiple layers, colours, frames and timing
6. Published prepared animation of above for web or other media

**Guidance for assessments and evaluations**

1. Explore features in an animation
2. Create a simple animation program
3. Publish the created animation

**Quality inputs**

- <http://vectorian.com/downloads/>
- <https://www.youtube.com/watch?v=FyHrbvo06IY>
- <https://www.youtube.com/watch?v=HyQ8vYN6adM>
- <https://www.youtube.com/watch?v=NjEIQSDUe8c>

**Competency level:** 13.3 Edit Audio and video contents using suitable software

**Time:** Two periods

**Learning Outcome:**

- Carries out basic audio editing using software
- Carries out basic video editing using software

**Content**

- Recording audio content.
- Editing (extracting a relevant segment from original content)

**Concepts and terms that need to be highlighted**

- Describe the audio and video files and time varying data
- Explain how to record audios and edit them
- Video as a combination of visual frame sequence and audio stream

**Guidance for lesson planning:**

1. Use suitable software to create audio such as *Audacity* .
2. Demonstrate video file on a timeline of a suitable software to show visual frames and audio streams
3. Prepare a video file and add created audio
4. Edit the above created files and represent them (only cut base editing)
5. Present their creation

**Guidance for assessments and evaluations;**

1. Prepare audio and video files
2. Present them and publish
3. Export these files to create animation program

**Quality Inputs:**

- <https://www.youtube.com/watch?v=3uqCNjbQn54>
- <https://www.youtube.com/watch?v=G7BZjjH4I9M>
- <https://www.youtube.com/watch?v=ztM01liuOug>

**Competency level: 13.4 Effectively integrates multimedia contents**

**Time:** Two periods

**Learning Outcome:**

- Designs multimedia according to basic requirements
- Integrate multimedia using software tools.

**Content:**

- Integration of background images with animations
- Integration of audio and video

**Concepts and terms that need to be highlighted**

- Use of layers to mix multimedia elements
- Interpretation of specifications into real products.

**Guidance for lesson planning:**

1. Provide previously developed multimedia elements (video and audio)
2. Demonstrate using suitable software to integrate these elements
3. Let students develop such material according to given specifications: this may be given as final product already compiled

**Guidance for assessment and evaluation:**

1. Provide a set of specifications for a multimedia output.
2. Provide relevant multimedia elements (audio and video)
3. Instruct students to produce the required multimedia output using the given software.

**Competency: .14. Develops websites incorporating Multimedia Technology.**

**Competency level: 14.1 Structures information for development of websites**

**Time:** Two periods

**Learning Outcome:**

- Identifies user needs of the website
- Designs website according specifications

**Content:**

- Contents for websites
- Analysis of the purpose and the audience
- Organization of the content/messages
- Design of the layout and structure: scheme, color, font.
- Selection of media assets

**Concepts and terms that need to be highlighted:**

- Design of the website should be determined according to user needs.
- Selection of a width that suits any computer monitor resolution
- Time saving in loading the website
- Avoiding of browser dependency in viewing the website.

**Guidance for lesson planning:**

1. Arrange for students to view several exemplary websites and discuss their organization.
2. Divide the class into groups of 4-6, instruct each to group select a topic for a website
3. Instruct the students to decide on the components that should be entered in the website to suit the topic , taking care about the task and layout.
4. Instruct the students to prepare a layout of the required website.

**Guidance for assessment and evaluation:**

1. Design an individual activity to design a website of students own choice.
2. Check whether the basic features of a website and proposals for proper multimedia integration are considered.

**Quality inputs:**

- <http://www.wikihow.com/Design-a-Website>
- <http://www.thesitewizard.com/gettingstarted/startwebsite.shtml>
- <http://www.creativebloq.com/web-design/steps-perfect-website-layout-812625>

**Competency level: 14.2Uses HTML basics**

**Time:** Two periods

**Learning Outcome:**

- Explains the use of basic tags in HTML.
- Creates simple web pages using HTML.

**Content;**

- Difference between hypertext and normal text.
- Features of HTML
- HTML document structure :Head, Title, Body
- HTML basics
  - Line and paragraph breaks
  - Text: format and color
  - Insertion of images
  - Use of hyperlinks
  - Lists
  - Tables

**Concepts and terms that need to be highlighted;**

- Single and paired tags
- Use of more than one tag on single object

**Guidance for lesson planning:**

1. Let students open a webpage in the browser and view source code.
2. Guide them to identify main components in terms of HTML tags.
3. Let students view the source code of teacher created simple webpage.
4. Let them make changes to source code as instructed by the teacher.
5. Let students write HTML codes to make a webpage according to specifications.

**Guidance for assessments and evaluations:**

1. Provide students with a print out of a simple webpage and ask them to write the required HTML codes to create such a page.
2. Display a webpage and ask students to create a similar webpage using HTML.

**Quality inputs:**

- <https://www.youtube.com/watch?v=9gTw2EDkaDQ>
- <https://www.youtube.com/watch?v=v4oN4DuR7YU>
- <https://www.youtube.com/watch?v=bWPMSSsVdPk>

## **Competency level: 14.3 Develops web sites using web development tools**

**Time:** Five periods

### **Learning Outcomes:**

- Uses web authoring tools to develop websites.
- Explains the purpose and the process of content managed websites.
- Uses CMS tools to create and manage websites.

### **Content:**

- Web authoring tools
- Text Formatting
- Page Layout
- Use of Multimedia building blocks: text, graphics, audio and video
- Hyperlinks
- Methods of web development
  - Static vs dynamic webs
  - Content managed web development
- Content Management Systems (CMS)
  - The purpose of the process of CMS based web development:
  - Work-flow and roles in CMS
  - Content creation, editing, publishing, and use
  - Roles: Creator, editor, publisher, administrator, user

### **Concepts and terms that need to be highlighted:**

- Need of web authoring tools
- Software that allows saving documents as web pages.
- Use of generic software to create websites
- Use of content management systems to create and publish websites by non-technical persons.

### **Guidance for lesson planning:**

1. Demonstrate the use of a web authoring software
2. Let students develop one web site with 2-3 pages
3. Demonstrate the use of a CMS(*Joomla*) on local host server
4. Let students simulate the use of CMS on local host server

### **Guidance for assessment and evaluation:**

1. Provide specifications to develop a simple web page using a web authoring tool
2. Provide specifications to develop a simple web page using a CMS

### **Quality Inputs**

- <https://www.youtube.com/watch?v=MH36mH88iDA>
- <https://www.youtube.com/watch?v=B-7jsURjLiU>
- <https://www.joomla.com/>

**Competency level: 14.4 Demonstrates preparedness to publish web sites**

**Time:** One period

**Learning Outcome:**

- Identifies features of web publishing.
- Publishes on free hosts.

**Content:**

- Internet Service Providers for Web Publishing
- Maintenance of a website

**Concepts and terms that need to be highlighted:**

- Process of publishing of a website
- Regular update of the website

**Guidance for lesson planning:**

1. Explain the requirement of an Internet service provider to host the website.
2. Instruct them to evaluate and test the website before publishing
3. Simulate the publishing on local host (using XAMP to simulate client-server set up)
4. Help students to find free web hosting services
5. Help them upload their web sites to the host machine.
6. Monitor if they regularly update the website
7. Contact Schoolnet to publish websites through their Joomla CMS.

**Guidance for assessments and evaluations:**

1. Ask students to develop a website
2. Let them publish on the internet

**Quality Inputs:**

- <https://www.youtube.com/watch?v=ZeOyiEUy808>
- <https://www.youtube.com/watch?v=hGIXSvcaGrg>

**Competency: 15. Compares and contrasts benefits and issues related to ICT in society**

**Competency level: 15.1 Investigates the contribution of ICT to the health sector**

**Time: 3 periods**

**Learning Outcome:**

- Describes the use of ICT in health services
- Describes the use of ICT based medical equipment
- Describes the use of ICT in medical records

**Content:**

- ICT in health services
  - Tele Medicine
  - Tele monitoring
- Computer controlled medical equipment
  - Computer Axial Tomography (CAT) scanner
  - Magnetic Resonance Imaging
- Maintenance of medical history records
  - Clinical history
  - Medication
- Tset Reports

**Concepts and terms need to be highlighted:**

- Quality and effective health through ICT
- Use of computer based equipment in health.
- Not to confuse tele-medicine with other ICT enhanced services
- Databases of patients details

**Guidance for lesson plans:**

1. Show the video clips and explain the function of each equipment
2. Discuss and list the technological equipment in a hospital maintained for treatment of patients
3. Discuss that the Internet is used extensively in health services
4. Explain that through the use of such equipment, doctors can take quick decisions in the process of treatment of patients.

**Guidance for assessment and evaluation:**

1. Set group activities to prepare presentations on various aspects of the use of ICT in health sector.
2. Encourage students to search the Internet to gather information particularly through multimedia.

**Quality inputs:**

- <https://www.youtube.com/watch?v=g5BXGII0cI>
- [http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/icts-and-the-health-sector\\_9789264202863-en#page2](http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/icts-and-the-health-sector_9789264202863-en#page2)
- <http://www.iicd.org/files/ICT-in-the-health-sector.pdf/>

**Competency level: 15.2 Investigates the contribution of ICT to education.**

**Time: One period**

**Learning Outcome:**

- Explains the use of ICT in interactive learning
- Describes the use of ICT in LMS
- Explains the use of ICT in school management

**Content:**

- ICT Assisted Learning (e-learning)
  - Interactive teaching and learning material
  - Web-based learning
- Learning Management Systems (LMS)
- School Management Information System

**Concepts and terms that need to be highlighted:**

- e-Learning
- Interactivity provided by a computer.

**Guidance for lesson plans:**

1. Lead a discussion with students to identify numerous modes of ICT in education.
2. Find examples from the Sri Lankan school system
3. Discuss how the school management could be enhanced with the use of ICT

**Guidance for assessments and evaluations:**

1. Organize a group activity to produce a presentation on the use of ICT in education.
2. Assess them on the explanation and examples provided to elaborate their views.

**Quality Inputs:**

- <http://www.iicd.org/files/ICT-in-the-education-sector.pdf/>
- <http://www.unescobkk.org/education/ict/ict-in-education-projects/capacity-building/e-learning-cd-rom/>
- <http://www.nie.sch.lk/resource/saarcjer0811.pdf>

**Competency level: 15.3 Investigates the contribution of ICT to agriculture**

**Time: One period**

**Learning Outcome:**

- Explains in brief the use of ICT to enhance productivity
- Explains in brief the use of ICT in dissemination of information in agriculture.

**Content:**

- Computer controlled agricultural equipment : Green houses
- Information searching on agriculture
- Virtual competitive market for agricultural products
- Optimization of agricultural productivity
- Detection and control of pests
- Optimization of fertilizer use
- Weather prediction

**Concepts and terms that need to be highlighted:**

Benefits that farmers would receive from the use of ICT in agriculture

**Guidance for lesson plans:**

1. Demonstrate the use of ICT in agriculture using video.
2. Let students to list out such applications
3. Lead a discussion to elaborate the use of ICT in agriculture

**Guidance for assessment and evaluation:**

1. Set questions to explain ICT in agriculture.
2. Check if students explain the effect and elaborate with examples

**Quality inputs:**

- <https://www.youtube.com/watch?v=Q46ALT4SSU4>
- [https://www.youtube.com/watch?v=vTDvQT\\_Kenw](https://www.youtube.com/watch?v=vTDvQT_Kenw)
- <http://www.e-agriculture.org/ict-agriculture-sourcebook>

**Competency level: 15.4 Investigates the Usage of ICT in different industries**

**Time: One period**

**Learning Outcome:**

- Explains the use of ICT in engineering designs
- Explains the use of ICT in production

**Content:**

- Architecture- Computer Aided Design(CAD)
- Manufacturing - Computer Aided Manufacture (CAM) /Computerized machines in manufacturing
- Production - Robotic

**Concepts and terms that need to be highlighted;**

Merits and demerits of the use of CAD, CAM and Robotics

**Guidance for lesson plans:**

1. Let students watch educational movies on the use of ICT in industry
2. Let them list out such ICT applications
3. Explain advantages and limitations in such uses

**Guidance for assessments and evaluations**

1. Set questions to explain ICT in industry.
2. Check if students explain the effect and elaborate with examples

**Quality Inputs:**

- <http://www.bbc.co.uk/schools/gcsebitesize/design/resistantmaterials/processindpracrev2.shtml>
- [http://www.soumu.go.jp/menu\\_seisaku/ict/u-japan\\_en/new\\_r\\_i04m.html](http://www.soumu.go.jp/menu_seisaku/ict/u-japan_en/new_r_i04m.html)
- <https://www.youtube.com/watch?v=u-Nj8D6Umec>

**Competency level: 15.5 Explores the contribution of ICT to Business**

**Time: One period**

**Learning Outcome:**

- Explains the use of the Internet in business
- Explains the use of ICT in advertising
- Explains the use of the Internet in BPO.

**Content:**

- e-Business
  - Internet based (on-line) shopping
  - Internet based (on-line) Share market transactions
  - Safety measures
- Advertising
- IT-Business Process Outsourcing (IT- BPO )

**Concepts and terms that need to be highlighted;**

- Merits and demerits of the Internet based marketing
- Numerous the Internet based marketing services`
- Share market
- Advertising on the Internet

**Guidance for lesson plans:**

Lead a discussion on the following issues:

1. Precautions against the Internet based shopping: for buyers and sellers
2. Merits and demerits of such activities: to buyers and sellers
3. The Internet based share market activities
4. Advertising on the Internet
5. Online purchase and POS systems

**Guidance for assessment and evaluation:**

1. Set questions to explain the Internet based business activities.
2. Check if students explain the effect and elaborate with examples

**Quality Inputs:**

- <http://www.businessnewsdaily.com/4872-what-is-e-commerce.html>
- <http://www.pcmag.com/article2/0,2817,2421846,00.asp>
- <http://www.pcmag.com/article2/0,2817,2421846,00.asp>

## **Competency level: 15.6 Explores the contribution of ICT to Entertainment**

**Time: One period**

### **Learning Outcome**

- Describes the use of ICT in movies and games production.
- Explains the use of ICT in audio editing.

### **Content**

- Movies and cartoon production
- Digital sound editing
- Games
- Simulations

### **Concepts and terms that need to be highlighted**

- Software used to produce multimedia elements
- 3D graphics and 3D realisms
- Music composing
- Creation and editing of audio files
- Computer games
- Need for simulation

### **Guidance for lesson plans:**

1. Lead a discussion to highlight the following facts:
  - a. Production of movies and cartoons
  - b. Methods used in the early days (hand drawing)
  - c. How to use software to do animations
  - d. With sufficient practice it will be easy for most people to create cartoons
  - e. Let student watch such productions
2. Show internet-based games
3. Demonstration of the use of simulation.

### **Guidance for assessments and evaluations**

1. Set questions to explain the use of ICT in entertainment.
2. Check if students explain the effect and elaborate with examples

### **Quality Inputs:**

- <http://www.jiscdigitalmedia.ac.uk/guide/basic-audio-editing>
- <http://en.wikipedia.org/wiki/Simulation>

**Competency level: 15.7 Assesses issues related to ICT with respect to ethical and legal aspects**

**Time: One period**

**Learning Outcome**

- Explains in brief legal issues in the use of ICT
- Explains in brief ethical situation connected with the use of ICT

**Content:**

- Legal Issues
  - Data theft
  - Unauthorized access to systems
- Intelligent property: copyright, patents and piracy.
- Privacy
- Forgery
- ICT legislation framework in Sri Lanka
- Ethical issues: Fair use, plagiarism.

**Concepts and terms that need to be highlighted**

- Difference between illegal and unethical use of ICT resources
- Implications of each type of misuse.

**Guidance for lesson plans:**

1. Lead a discussion to bring out the unauthorized use of ICT software.
2. Explain the legal environment in Sri Lanka to prevent such uses.
3. Explain the effect of misuse of ICT resources on various parties.

**Guidance for assessment and evaluation:**

1. Set questions to explain legal and ethical issues in the use of ICT.
2. Check if students explain the effect and elaborate with examples

**Quality Inputs:**

- [http://www.facetpublishing.co.uk/downloads/file/sample\\_chapters/Chapter%20%20Managing%20access.pdf](http://www.facetpublishing.co.uk/downloads/file/sample_chapters/Chapter%20%20Managing%20access.pdf)
- <http://www.unece.org/fileadmin/DAM/ceci/publications/ict.pdf>
- [http://www.theredhillacademy.org.uk/pluginfile.php/12545/mod\\_resource/content/1/Chapter%206.pdf](http://www.theredhillacademy.org.uk/pluginfile.php/12545/mod_resource/content/1/Chapter%206.pdf)

**Competency level: 15.8 Explores issues and precautions related to ICT with respect to security aspects**

**Time:** 2 periods

**Learning Outcome:**

- Identifies security issues.
- Takes precautions to eliminate or minimize security threats.

**Content:**

- Physical Security
  - UPS
  - Hardware firewalls
  - Restricted access via door-locks
  - CCTV surveillance
  - Surge protectors
- Logical Security
  - Passwords
  - Software firewalls
  - Backups
- Protection against malware: spam, virus, key-loggers

**Concepts and terms that need to be highlighted:**

- In the use of ICT tools there can be threats and influences brought upon the data as well as the information in them
- Reasons for loss of data
- Various aspects of protection: Physical(hard) and logical(soft)

**Guidance for lesson plans:**

1. Discuss the problems regarding the defects in the hardware and software in the computer lab.
2. Note the content above systematically on the whiteboard and explain them.
3. Demonstrate the use of anti-virus software to protect software.
4. Appreciate how the ICT resources are kept clean, list out maintenance activities a user has to follow daily.

**Guidance for assessment and evaluation:**

1. Question the students orally regarding the tasks that should be carried out daily with respect to maintenance activities of a computer lab.
2. Practical examination of operations software usage for the protection of data and information in the operating system.

**Quality Inputs:**

- <http://www.ru.ac.za/informationtechnology/itdivision/policiesandprocedures/security/>
- <http://www.bbc.co.uk/schools/gcsebitesize/ict/databases/6datasecurityrev3.shtml>
- <http://www.techrepublic.com/blog/10-things/10-physical-security-measures-every-organization-should-take/>

## **Competency level: 15.9 Investigates health and safety issues inherent in ICT use**

**Time:** Two periods

### **Learning Outcome:**

- Explains basic health issues associated with the use of computers.
- Explains the precautions to be taken in the use of computers.
- Explains safe disposal methods of electronic equipment.

### **Content:**

- Ergonomics and Health issues
  - Repetitive Strain Injury
  - Eye-strain
  - Backaches
- E-waste: Hazardous elements and its impact on the environment.
- Safe disposal and destruction of electronic equipment

### **Concepts and terms that need to be highlighted:**

- Health issues involved in the long-time use of computers and proper use of computers
- Electronic waste and identification of its adverse effects
- Proper disposal of electronic waste

### **Guidance for lesson plans:**

Step1:

- i. Divide the class into three, one week before the lesson
- ii. Guide students to search information on the following topics
  - a. Environmental and health issues in the use of computers
  - b. Electronic waste and its adverse effects
  - c. Disposal of electronic waste

Step 2

- i. Provide a brief introduction to the topics.
- ii. Let the groups present information they have collected.
- iii. Lead a discussion for each presentation

### **Guidance for assessment and evaluation:**

1. Set questions to explain health and environmental issues in the use of computers
2. Check if students explain the effect and elaborate with examples

### **Quality Inputs:**

- <http://www.igcseict.info/theory/6/safe/>
- <http://www.ictknowledgebase.org.uk/healthandsafety>
- [https://www.youtube.com/watch?v=\\_v2bwkjPjjk](https://www.youtube.com/watch?v=_v2bwkjPjjk)

**Competency level: 15.10 Assesses the Social issues inherent in ICT use**

**Time:** One period

**Learning Outcome**

- Explains problems caused by ICT in the society
- Explains briefly changes in employments caused by advances of ICT

**Content**

- Digital divide
- Digital bridge
- De-skilling
- Techno-rich employment
- Equal Opportunities
- Misuse of ICT and precautions to be taken (social media)

**Concepts and terms that need to be highlighted**

- Loss of equity
- Loss of manual and mental skills

**Guidance for lesson plans:**

1. Lead students to list lack of access opportunities to ICT based information faced by people.
2. Explain the reasons for them
3. Lead students to list employment enhanced by ICT
4. Let them point out human skills affected as a result

**Guidance for assessment and evaluation:**

1. Set structured essay type questions
2. Check whether students explain the concept and elaborate with examples.

**Quality Inputs:**

- [http://www.slideshare.net/Group\\_5/working-with-ict-ethical-social-and-legal-issues](http://www.slideshare.net/Group_5/working-with-ict-ethical-social-and-legal-issues)
- <http://iite.unesco.org/pics/publications/en/files/3214629.pdf>
- [http://www.eurosfair.pr.fr/7pc/doc/1304928786\\_eiex06etica2.pdf](http://www.eurosfair.pr.fr/7pc/doc/1304928786_eiex06etica2.pdf)