Information and Communication Technology

GRADE 12

Teacher's Instruction Manual

(Implementation in 2009)

Department of Information Technology

Faculty of Science and Technology

National Institute of Education

2009

Introduction

Curriculum developers of the NIE were able to introduce Competency Based Learning and Teaching curricula for grades 6 and 10 in 2007, extend it to Grades 7, 8 and 11 progressively, every year and even to GCE (A/L) classes in 2009. In the same manner, syllabi and Teachers' Instructional Manuals for grades 12 and 13 for different subjects along with competencies and competency levels that should be developed in students, are presented descriptively. Information given on each subject will immensely help teachers to prepare for the Learning – Teaching situations.

I would like to mention that curriculum developers have followed a different approach when preparing Teachers' Instructional Manuals for Advanced Level subjects compared to the approaches they followed in preparing Junior Secondary and Senior Secondary curricula . (Grades 10,11)

In grades 6,7,8, 9, 10 and 11 teachers were oriented to a given format as to how they should handle the subject matter in the Learning – Teaching process, but in designing AL syllabi and Teacher's Instructional Manuals freedom is given to the teachers to work as they wished.

At this level, we expect teachers to use a suitable learning method from the suggested learning methods given in the Teacher's Instructional Manuals to develop competencies and competency levels relevant to each lesson or lesson unit.

Whatever the learning approach the teacher uses, it should be done effectively and satisfactorily, to realize the expected competencies and competency levels.

I would like to note that the decision to give this freedom is taken, considering the importance of GCE (A/L) examinations and the sensitivity of other stakeholders in the education system up to the Advanced Level examination. I hope that this Teacher's Instructional Manual will be of great help to teachers.

I hope the information, methods and instructions given in this Teacher's Instructional Manual will provide proper guidance to teachers to stimulate the minds of our students.

Professor Lal Perera
Director General
National Institute of Education

Foreword

Action taken over long years of the past to retain the known and learn the predetermined has made us little able today to construct even what is. The first curriculum reform of the new millennium on secondary education that comes to being with a drastic change in the learning-teaching process at school level attempts to overcome this deficiency while bringing out a set of worthy citizens for the country capable of revising the known, exploring the undetermined and constructing what might be.

If you are a teacher teaching this subject or any other subject in grades 6 to 11, it will not be difficult for you to align yourself with the new learning-teaching approaches that are recommended considerably for the GCE (A/L) as well. This reform calls the teacher to identify competency levels under each competency and plan activities to achieve them. The teachers entering the new role of transformation should understand that the procedures which emphasize the teacher in the learning-teaching process are of limited use for the present and that it is more meaningful for the children to learn co-operatively, sharing their experiences. This situation, however, requires the teachers to provide a new direction to their teaching by selecting new learning–teaching methods that emphasize the student over the teacher.

If you study the Teachers' Instructional Guides (TIGs) prepared by the National Institute of Education for Mathematics, Science, Health & Physical Education, Technology and Commerce subjects of grades 6 to 11, you certainly will be able to acquire good understanding of the student-centred, competency based and activity- oriented approaches we have recommended for learning and teaching. The activities presented in these Guides attempt to bring learning, teaching assessment and evaluation onto the same platform and to help you to adopt co-operative learning techniques on the basis of the 5E Model.

Considering the need to establish an innovative teaching force we have selected just a few activities from the relevant activity continuum incorporated in the TIGs. Yet, we have given you vast freedom to plan your own activities to suit the subject and the class requirements by studying the exemplar activities in the Guides and improving your understanding of the principles underlying the reform. The activities incorporated in the TIG, provide you with four types of information. At the beginning of each activity you come across the final outcome that the children are expected to achieve through each activity. This learning outcome named a 'Competency' is broad and long-term. The competency level stated next highlight one out of a number of abilities that children have to develop to realize the competency.

The above explanation shows us that the competency levels are more specific and of a shorter duration when compared to the competency. The next section of the Guide presents a list of behaviours that the teacher has to observe at the end of each activity. To facilitate the task of both the teacher and the students, an attempt has been made to limit the number of such

behaviours, to five. These behaviours, referred to as learning outcomes, are more specific than the competency level. They include three abilities derived from the subject and two others derived from the learning teaching process. Out of the three subject abilities listed in order of difficulty, the teacher has to direct the children to realize at least the first two through exploration. The next section of the activity presents what the teacher should do to engage the children in exploration. Although the implementation of each and every activity starts with this step of engagement, the teachers should not forget that activity planning should begin with the "exploration" which is the second 'E' of the 5E Model.

Instructions for the group exploration form the next section of the exemplar activities and the teacher plans these instructions in such a way as to allow different groups studying different facets of the same problem to reach the expected goals through a variety of learning-teaching methods. Further this, the teacher can select either Inquiry-based Learning carried out through a series of questions or Experiential Learning where children learn by doing. It is the responsibility of the GCE (A/L) teacher to use the knowledge that the children acquire by any of the above methods to solve problems that are specific to the subject or that runs across a number of subjects of the curriculum.

It is meaningful to plan such problem-based learning-teaching methods on the basis of real-life situations. For this, you can select dilemmas, hypothetical situations, analogies or primary sources. Some techniques that can be used for the explorations are reading, information management, reflection, observation, discussion, formulation and testing of hypotheses, testing predictions, preparing questions and answers, simulation, problem solving and aesthetic activities such as drawing or composing. There is room here even for memorization although it is considered a form of mechanical learning.

The students explore in small groups. Instead of depending on the knowledge available to the teacher, they attempt to construct their own knowledge and meaning with the support of the teacher. Moreover, they interact with others in the group to learn from others and also to improve the quality of their exploration findings. All this work successfully only if the teacher is capable of providing the students with the reading material and the other inputs they are in need of. The teacher also has to support student learning throughout the learning process by moving from one group to another. Although it is discovery that is prominent in this type of learning you have to recognize this as a guided discovery rather than free discovery. There is no doubt that students learning likewise, with instructional scaffolding both by the teacher and the peers acquire a whole range of worthwhile experiences that they find useful in later life.

Explanation follows the second stage of exploration. The small groups get ready to make innovative, team presentations on their findings. The special feature here is that the children have selected novel methods for their presentations. The responsibility for the presentation is also shared by all members of the group. In the next step involving elaboration, the children get the opportunity to clarify the unclear, correct the incorrect and fill any gaps that are left. They

also can go beyond the known to present new ideas. All activities end with a brief lecture made by the teacher. This stage allows the teacher to go back to the transmission role. The teacher also has to deliver this lecture covering all the important points that the syllabus has prescribed for the relevant competency level. Step 3 of each Activity Plan guides the teachers in this compulsory final elaboration.

To overcome many problems that are associated with the general system of education today, the National Institute of Education has taken steps to move the teachers to the new transformation role recommended for them. This role that starts with a transaction gets extended to a lengthy exploration, a series of student explorations and elaborations and a summative transmission by the teacher. The students involve themselves in exploration using reading material and other quality inputs provided to them by the teacher.

The students attend school daily to learn joyfully. They achieve a number of competencies that they need to be successful in life and the world of work. They prepare themselves for nation building by developing thinking skills, social skills and personal skills. For the success of all this, an examination system that inquires into the ability of students to face real challenges of life is very much needed in place of an examination system that focuses on the knowledge acquired by children by memorizing answers to model questions.

A number of activities have already begun at the national level to project the real nature of school-based assessments. The written tests have been minimised for school-based assessments to gain recognition. A compulsory question has been incorporated in the term tests along with a scheme of authentic evaluation to ensure real outcomes of learning. It is the co-ordinated responsibility of all citizens of the country to open up doors for a new Sri Lanka by striving for the success of this new programme on the basis of sound instructional leadership and quality assurance by the management.

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Instructions on the study of the Teachers' Instruction Manual

This Teachers' Instruction Manual prepared for the Grade 12 G.C.E (A/L) Information and Communication Technology subject scheduled to start in year 2009. The TIM consists of 15 activity levels selected for definite activity levels for Grade 12.

Learning outcomes have been included for these 15 activity levels. You have to follow a student centered learning teachning process that helps the student to achieve these learning outcomes and competency levels. For this purpose, approaches and suggested instructions for learning, with respect to selected competency levels, have been included as guidance to you. "A guide to understanding subject matter" has been provided here at the end of the activities. It is a guide to the subject matter you should discuss with the students at the end of the activities.

It is important that in the use of this Teachers' Instruction Manual you focus on the points below.

- Python - Open Source should be used as the Programming Language for competency no 7.

- Python Language should be used first of all in the Interactive Mode such that students are able to grasp what Computer Programming is, quite well. In this regard it is very important that attention is paid to the provision of correct understanding to students regarding the characteristics of Python Language and data structures. For this purpose, the Python commands/statements should conform to the grammatical rules of that language. The aims above can be achieved through the constant involvement of students in classified exercises. Finally, what should be done, is to train students to write small programmes for the solution of simple problems through the Interactive Mode.

- Three Evaluation Instruments have been prepared for the first term of Grade 12.

Content Page

Competency 1:   Explores the basic concepts of ICT together with its role and applicability in today's knowledge based society.

Competency Level 1.1:   Investigates the basic building blocks of information and their characteristics.

Number of Periods: 05

Learning Outcomes:
* Identifies the characteristics of data.
* Creates Information by processing various data.
* Utilizes information in taking decisions.
* Classifies information in terms of relevance.
* Updates knowledge using information with understanding.

Learning- Teaching Process:

Approach:
* In the class room, distribute the table below published by the Department of Census and Statistics.

14 වෙනි පරිච්ඡේදය - අධ්‍යාපනය அத்தியாயம் 14 –கல்வி   CHAPTER XIV - EDUCATION

සාක්ෂරතාවය සහ ස්ත්‍රී පුරුෂ භාවය අනුව ජනගහණය (අවුරුදු 10 සහ ඊට වැඩි), සංගණන වර්ෂ
தொகைமதிப்பு வருடங்களில் எழுத்தறிவுப்படியும் ஆண் பெண் பீர்வுப்படியும்
சனத்தொகை (10 வருடமும் அதற்கு மேலும்)
Population (10 years and over) by literacy and sex, census years

14.1 වෙනි වගුව அட்டவணை 14.1 Table 14.1

අයිතමය	விடயம்	Item	1953	1963	1971	1981	2001*
අවුරුදු 10 සහ ඊට ඉහළ ජනගහණය (' 000)	சனத்தொகை 10 வருடங்களும் அதற்கு மேலும் ('000)	Population 10 years and over ('000)					
මුළු ගණන	மொத்தம்	Total	5,803	7,523	9,354	11,309	14,006
පිරිමි	ஆண்	Male	3,110	3,952	4,839	5,768	6,937
ගැහැණු	பெண்	Female	2,693	3,571	4,515	5,541	7,069
අවුරු කියවීමට හා ලිවීමට හැකියාව ඇති ජනගහණය (' 000)	எழுத்தறிவுடையோர் சனத்தொகை ("000)	Literate Population					
මුළු ගණන	மொத்தம்	Total	4,006	5,789	7,344	9,865	12,763
පිරිමි	ஆண்	Male	2,510	3,385	4,143	5,257	6,423
ගැහැණු	பெண்	Female	1,496	2,404	3,201	4,608	6,340
අවුරු කියවීමේ හා ලිවීමේ හැකියාව ඇති ප්‍රතිශතය	எழுத்தறிவு விதம்	Percent Literate					
මුළු ගණන	மொத்தம்	Total	69.0	77.0	78.5	87.2	91.1
පිරිමි	ஆண்	Male	80.7	85.7	85.6	91.1	92.6
ගැහැණු	பெண்	Female	55.5	67.3	70.9	83.2	89.7

* 2001 ජන සංගණනය සම්පූර්ණ නොකළ ලද යාපනය, මන්නාරම, වවුනියාව, මුලතිව්, කිලිනොච්චි, මඩකලපුව සහ ත්‍රිකුණාමලය දිස්ත්‍රික්කයන් මෙහි අන්තර්ගත නොවේ.
* 2001 தொகைமதிப்பு பூர்த்திசெய்யப்படாத யாழ்ப்பாணம், மன்னார், வவுனியா, முல்லைத்தீவு, கிளிநொச்சி, மட்டக்களப்பு, திருகோணமலை மாவட்டங்கள் இங்கு உள்ளடக்கப்படவில்லை.
* Jaffna, Mannar, Vavuniya, Mullativu, Kilinochchi, Batticaloa and Trincomalee Districts in which the 2001 census enumeration was not completed are not included here.

මූලාශ්‍රය - ජනලේඛන හා සංඛ්‍යාලේඛන දෙපාර්තමේන්තුව
ஆதாரம் –தொகைமதிப்பு புள்ளிவிபர திணைக்களம்
Source - Department of Census and Statistics

14.2 සේවිඡ කට්ටලය 14.2 Table 14.2

දිස්ත්‍රික්කය	மாவட்டம்	District	මුළු ගණන மொத்தம் Total	පිරිමි ஆண் Male	ගැහැණු பெண் Female
ශ්‍රී ලංකාව	இலங்கை	Sri Lanka	91.0	92.6	89.7
කොළඹ	கொழும்பு	Colombo	94.7	95.3	94.0
ගම්පහ	கம்பஹா	Gampaha	95.4	95.7	95.1
කළුතර	களுத்துறை	Kalutara	93.2	93.7	92.6
මහනුවර	கண்டி	Kandy	90.5	92.4	88.7
මාතලේ	மாத்தளை	Matale	88.3	90.2	86.4
නුවර එළිය	நுவரெலியா	Nuwara Eliya	82.6	87.6	77.7
ගාල්ල	காலி	Galle	92.3	93.2	91.5
මාතර	மாத்தறை	Matara	90.3	91.9	88.9
හම්බන්තොට	அம்பாந்தோட்டை	Hambantota	88.9	90.9	87.0
අම්පාර	அம்பாறை	Ampara	85.9	88.9	82.9
කුරුණෑගල	குருணாகல்	Kurunegala	92.7	93.9	91.5
පුත්තලම	புத்தளம்	Puttalam	90.7	91.2	90.3
අනුරාධපුරය	அநுராதபுரம்	Anuradhapura	90.5	92.1	88.8
පොළොන්නරුව	பொலன்னறுவை	Polonnaruwa	90.0	91.2	88.7
බදුල්ල	பதுளை	Badulla	85.2	88.9	81.7
මොණරාගල	மொனராகலை	Moneragala	86.0	88.1	83.8
රත්නපුරය	இரத்தினபுரி	Ratnapura	88.4	90.4	86.3
කෑගල්ල	கேகாலை	Kegalle	91.4	93.0	89.8

- Give a student the opportunity to explain, from where this type of documents are got and how to obtain the necessary data for presentations.
- Conduct a discussion so as to highlight the following.
  - That these tables contain very important information.
  - Future plans of the country will be prepared based on this information.
  - To prepare this information, data will be collected through Island wide census.
  - Information of this nature is revealed after the data collected are processed methodically.
  - In performing this task, collecting data, processing data and revealing them as information take place.
  - Whatever the instance the same process takes place when converting data into information.

Suggested instructions for learning:
- Study the reading material well.
- Draw the attention of the students to the topics below.
  - Total marks obtained for Mathematics, English, and Sinhala at the final grade 11 examination
  - Details regarding the parents of students (Name / Occupation)
  - Details regarding extra curricular activities of students (Sports / Posts)
- Collect data relevant to the topic assigned to your group.
- Create information from the data you have obtained.
- Identify the characteristics of information.
- Investigate the quality of information.
- Realize that the value of information declines with the passage of time.
- Discuss the relevance of information
- Get ready to make a creative and collective presentation to the class of what you discovered.

Reading Material

Data
A collection of non formal meaningless and disorganized items.

How data are formed
1. Text
   - Numerals (0…9)
   - Characters (a…z, A…Z අ…අ්)…ඓ…ඖ)
   - Codes (:, ;, ...)
   - Special characters ($,#,@)

2. Visual

3. Audio

Classification of Data
Data can be classified as quantitative and Qualitative.
1. Quantitative data can be presented quantitatively.
   - Can be subjected to an arithmetical process.
   - Can be arranged in numerical order
   - Numbers can be arranged scientifically

2. Qualitative data- Data that cannot be presented numerically.
   Ex: Shape, Color, Sound etc.

Information

Data arranged to be meaningful to a relevant individual, is called information

Qualities of Information

- Is meaningful
- Is fascinating
- Updates prior knowledge
- Is a medium of intercommunication
- While they are topical, they help decision making

Relevance of information

- Relevance of information varies from individual to individual

  Eg: Although the square root of a number to four decimal places is not necessary to a normal individual, it is important to a scientist.

Knowledge

- Is the skills and specialty acquired by an individual through education or experience.
- That which is conserved in the mind when a subject is used practically and understood theoretically.

Aids to understanding subject matter:

- Assign tasks and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from other groups.
- Lead a discussion to highlight the following.
  - Data exists in the form of Text, Image and Audio.
  - Data can be divided into two types: Qualitative and Quantitative.
  - Information is meaningful.
  - Information helps decision making.
  - Information has a value.
  - The relevance of information varies from individual to individual.
  - The individual acquires knowledge from ones own experiences or education.

Competency Level 1.3: Builds up an abstract model of information and appreciates its conformity to information and communication technology.

Number of Periods: 04

Learning Outcomes:
- Collects data on various topics and converts them into information.
- Selects information of the highest value and explains the logic that it is based on.
- Explains the importance of the use of the computer in information communication.
- Classifies information on the basis of its value.
- Takes steps to minimize information becoming outdated in order to maximise its utility.

Learning - Teaching Process:

Approach:
- Take into the classroom a newspaper published on the day the activity is implemented.
- Draw the attention of the students to the headline on its front page, several sub-titles, sports news and several articles in the center pages.
- Get a student who volunteers to list out, in order, the topics that drew the great attention of the students, through discussion.
- Lead a discussion to bring out the following.
  - That information under headlines, comparatively decreases or increses in value.
  - That the value of a piece of information depends on relevance and timelyness.
  - That there are other media that supply information instantly and attractively in comparison to newspapers.
  - That there is a greater preference for them as immediate information is provided in the least amount of time, through these media.
  - That information and communication technology is greatly helpful in the systematic preparation of data and its conversion to information for its instant release.

Suggested instructions for learning:
- Study the reading leaflet well.
- Pay attetion to the following locations in your school.
  - Classroom
  - School office
  - School library
- Collect and computerise data and information relevant to the topic assigned to your group.
- Separate data and information in the material you have computerised.
- Convert the data that has been separated, into information.
- Arrange all the information you have acquired in terms of its value.

- Discuss the assistence you got from the computer for your task.
- Present your findings creatively and co-opratively to the entire class.

<div align="center">

Reading Material

</div>

Input and output

Data are input into a computer: the data that has been input are processed under the control of a stored program in the memory in order to convert them into information. This is called data processing.

Finally the data input into the computer is processed and output as information.

Data ⟶ | Meaningful Process | ⟶ Information

The above is the Abstract Model of creating information. While data are obtained by the system at the input, it carries out a meaningful process in order to provide information at the output. This meaningful process is provided to the computer by a program stored in its memory.

Value of Information
- The value of information depends on its relevance.
- Information has a great value the moment it is created or at the moment it is received.
- The value of information will be at a maximum at the moment the time approximates to zero.
- The value of information gradually diminishes with the passage of time till it is reverted to data.

This is called the Golden Rule of Information.

Value of Information ↑ ... → Time
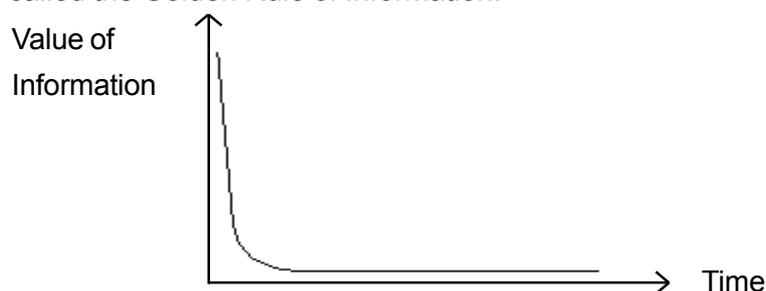
Aids to understanding subject matter:
- That data and information can be distinctly separated.
- That in Information and Communication Technology, information recieved as input is processed meaningfully as described in the abstrast model, Input - Process - Output.
- That, while the value of information depends on time the value of information is at a maximum when time approximates zero.
- That the computer makes a great contribution in Information and Communication Technology.

Competency Level 1.4:   Selects and classifies the basic components of a computer system.

Number of Periods: 05

Learning Outcomes:
- Separates hardware while studying the components of a computer system.
- Separates the software used to prepare the computer for operations from the software used to fulfil the user requirement.
- Separates the firmware that contributes to the implementation of the operating system for use and examines the suitability of the hardware in the computer system.
- Selects the components of the system meaningfully.
- Employs classification for the convenience of understanding complex systems.

Learning - Teaching Process:

Approach:
- Present to the class the views below, seen on the monitor respectively by a student who had booted up the computer.
- Display of letters on the screen and the flash of LEDs on the keyboard.
- Lead a discussion highlighting what the student had seen and also highlighting the main components of the computer, such as the keyboard, monitor and the student who booted up the computer.
  - That the stduent who booted up the computer falls into the category of liveware.
  - That the keyboard and the display unit fall into the category of hardware
  - That, with the operation of the firmwar,e the LEDs flash and display letters on the screen.
  - That the display of a graphical user interface through the lighting of the screen is the result of the activation of software.
  - That it is important to identify the various parts of the computer such as hardware, software, firmware and liveware which are the basic components of a computer system.

Suggested instructions for learning:

- Draw attention to the column assigned to your group in the table given below.

Colum1	Colum2	Colum 3
Keyboard	Mouse	Scanner
Monitor	Printer	Plotter
Compact Disc	Hard Disk	Pen Drive
Z 80 Processor	286 Processor	P 4 Processor
Modem	Network Interface Card	Hub
Operating Systems	Utility Programs	Compiler
Word Processing Software	Spreadsheet Software	Presentation Software
DBMS Open Source	Desk Top Publish Open Source	Spreadsheet Open Source
Software Developer	Data Entry Operator	Systems Analyst
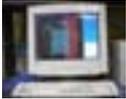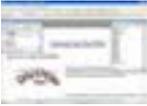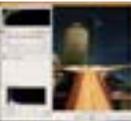
- Study the pictures and text included in the columns and identify as to which of the basic components of a computer system below, it represents.
  - Hardware
  - software
  - Firmware
  - Liveware
- Classify the identified hardware in terms of the devices below.
  - Input Devices
  - Output Devices
  - Control and processing Devices
  - Memory Devices
  - Communication Devices
- Use the following themes to classify the identified software.
  - System Software
  - Application Software
  - Licensed Software
  - Open source Software
- Prepare short notes in order to introduce each part under the column, to a novice to computers.
- Use reading material in order to differentiate between Firmware and Liveware in the column in order to present details regarding them.
- Get ready to make a creative and co-operative presentation of the information you have discovered, to the class.

Reading Material

Classification of components of a computer system and their need

There are four main components in a computer system. They are

1. Hardware
2. Software
3. Firmware
4. Liveware

By acquiring an understanding of these basic components let us get the ability to identify their need and to distinguish between them.

1. Hardware

The physical components of a computer system are called hardware. The basic qualities of hardware are that they can be handled and that they cannot be changed easily. In a computer system, the Central Processing Unit, Keyboard and the Monitor are considered its main hardware components, other hardware are basically identified as minor devices.

2. Software

The instructions given in sequence in order to operate a computer to achieve a particular aim are called computer software. There are several types of software depending on their applications. Let us take them into consideration in the course of software classification

3. Firmware

The program required initially to boot up a computer system is called firmware. Since these firmware are incooperated in the process of manufacturing hardware, they cannot be easily changed later on.

For example, Read Only Memory (ROM) in a computer. Further, firmware are incooperated in washing machines, microwave Ovens, Mobile phones IPods etc:

4. Liveware

Should one be engaged in handling a computer, at that moment, he or she is considered liveware

Classification of computer hardware

The main types of computer hardware are input devices, Output devices, Memory devices, control and processing devices and communication devices. We shall be discussing these hardware separately later on.

Input Devices

Devices used to supply data to a computer system are input devices.

Eg: Keyboards, Pointing devices, Scanners, Microphones, Digital Cameras, and Webcam etc.

Keyboard

The keyboard is used to input letters, numbers, symbols and commands to a computer system. Although the keyboard can be considered as an improved version of the normal typewriter keyboard its operation takes place electronically. A processor receives a unique electrical signal when the relevant key is pressed. The processor converts that signal to ASCII code and provides the relevant input to the computer system. Today both cable connected and wireless key boards are available in the market.

Pointing Devices

The main task of pointing devices is the opening of Icons created by pixels or pixel on the screen of a computer and the implementation of the related programs. For this purpose Mouse, Mouse pad, Touch screen, Touch pad, Trackball, Joystick etc. are examples. In order to send signals to the processor through them, cables or light waves are used.

Scanner

The scanner is used to input text and pictures in a hard copy to a computer system. One special feature of this is the storing of both text and pictures in image form in the computer memory. But if a scanner has Optical Character Reader facilities, then English letters like Times new Roman ,Arial are stored in the computer memory not in image form but in the letter form. Therefore, text can be easily edited.

Digital Camera

There are two types of cameras in terms of picture storage technology

1. Film Camera
2. Digital Camera

Since Images stored in the memory of a digital camera can be input to a computer, a digital camera is also an input device. Digital cameras also are of two types according to function, they are

1. Still digital camera
2. Movie digital camera

Various types of digital cameras are available in the market today. Also these cameras are found even in mobile phones

Webcam

Webcams are a type of cameras used to broadcast moving pictures in digital form. With their arrival in the field

1. Individuals can be seen live in an internet telephone connection
2. Teleconferencing etc;

have turned a new page in communication technology. These webcams can be purchased and connected externally to the computer. Similarly, there are laptops in the market with cams attached

Output Devices

These devices are used to give the processed information and signals from the computer. Monitors, printers and speakers are some examples for them.

Monitor

This is called the computer screen. According to technology, two types of monitors are in use today.

1. CRT- Cathode Ray Tube Monitor.
2. LCD – Liquid Crystal Display Monitor.

It is necessary to identify the advantages and disadvantages before they are used. In general, it is essential to acquire knowledge about the characteristics of the monitors.

1. The number of pixels per unit in the screen.
2. The number of colours that can be displayed.
3. The degree of harmful radiation emitted.

Printer

This is used to transfer the softcopy in the computer into a hardcopy. There are two types of printers such as Impact printers and non-impact printers. The impact printers are very noisy. Three types of printers are used today.

1. Dot Matrix printers (Impact printers)
2. Inkjet Printers (Non-Impact Printers)
3. Bubblejet printers (Non-impact printers)
4. Laser Printers (Non-Impact Printers)

These printers use different technologies and the manner of supplying ink is also different. To use a printer, the following things should be taken into consideration.

1. The quality of the hardcopy.
2. The cost for a copy.
3. The time spent on a copy.
4. Noise when in use.

Listening Devices

We will consider the devices used to listen to the sounds from the computer. These devices are of two types; such as the speakers and head set. Only the person who wears the head set can listen to the sounds from the computer.

Memory Devices

The devices used to store data and information for a short time or long time in a computer are called memory devices. These memory devices are of three types.

1. Random Access Memory (Internal)
2. Read Only Memory (Internal)
3. Backup Devices (External)

Random Access Memory

When a computer is started, the Operating System is input from the Hard disk to the Random Access Memory. Before data are processed, the data and instructions are also retained temporarily in this RAM. It holds them in the memory until the power is available. These are called Readable and Writeable Memories.

Read Only Memory

The Special Instructions necessary to boot up the computer is stored in this permanently by the manufacturer. These are called Read Only Memories. These ROMs are attached to the motherboard of the computer. This memory is only readable. The instructions stored in this are called Firmware.

Backup Storages

Backup storages are the storage media that store data permanently and they are also called secondary memory. The data stored here can be retrieved again and again and can be edited too. For example Hard Disk, Compact Disc, Floppy Diskettes, Pen Drives are some of them. Their technologies and functions may vary.

Control and Processing Devices

The two most essential tasks of the computer; such as calculations and controlling are done by a semi conductor device attached to the motherboard. This is called the central processing unit or the processor. In the development of the computer the main consideration should be given to CPU when we consider the evolution of the CPU. It is important to consider the technology used, calculation speed, capacity, size and type. The speed of the CPU is called clock speed and is measured in MHz, GHz. The CPU consist of three parts.

1. Control Unit
2. Arithmetic and Logic Unit (ALU)
3. Register Arrays

Control Unit

- Controls all the functions of the computer system.
- Decodes the instructions in the memory.
- Sends signals to the relevant parts.

Arithmetic and Logic Unit

- Does all types of mathematical calculations.
- Compares data.

Register Array

- Temporarily stores data and instructions until they are sent to the logical unit.
- Stores process information until it is sent to the main memory.

Communication Devices

There are many basic devices that link computer technology and communication technology in addition to the above devices such as the input devices, output devices, memory devices and control and processing devices.

Network Interface Card (NIC), Modem, Multiplexer, Bluetooth Adapter are some examples of them.

Computer Software Classification

A set of sequential instructions given to the computer system to carry out a specific task is called a software. Mainly, computer software are of two types.

1. System Software
2. Application Software

System Software

System software can be classified into three types according to usage. They are

1. Operating Systems
2. Language Translators
3. Utility Software

Application Software

The software used by the user of the computer to fulfil necessities is called Application Software. Some examples are Word Processing Software, Spreadsheet Software and Data Base Management Software etc. Unlike system software, daily new application software are available in the market.

Copyrighted Software and Open Source Software

When considering the copyright of software there are two things that have to be discussed.

1. Copyrighted Software
2. Open Source Software

Copyrighted Software

The software that belong to a party who have the legal rights, are called Copyrighted Software. Only those who have a license from the copyrighted party can use change or distribute this software. This software has a legal binding. Some of the companies of this type are Microsoft, Macromedia, Adobe etc.

Open Source Software

The software that does not have a copyright belongs to this category. This software legally allows the user to use, change and distribute it partially or completely. This software is also called Independent Software.

Aids to understanding subject matter:
- Present the findings of the small groups to the whole class.
- Provide the first opportunity to the group that made the presentation.
- Elicit constructive comments of the other groups.
- Lead a discussion to emphasize the following:
  - That there are four components in the computer system.
  - That the components are hardware, software, firmware and liveware.
  - That the hardware components could not be easily changed and are tangible.
  - That the programs that can be easily changed are called software.
  - That the programs needed to start/boot up the computer are called firmware.
  - That the person using the computer at the moment is called the liveware.
  - That computer hardware can be classified into five categories such as Input Devices, Output Devices, Memory Devices, Control and Processing Devices and Communication Devices.
  - That software can be mainly classified as system software and application software.
  - That Copyrighted Software and Open Source Software are the two main types of software found today.

Competency Level 1.6: Investigates the use of ICT in different fields of applications in organizations

Number of Periods: 05

Learning Outcomes:
- Names the areas where Information Technology can be used.
- Describes instances where these areas are used.
- Describes the advantages and disadvantages of Information Technology used.

Learning- Teaching Process

Approach:
- Present a picture of how an organization functioned several years ago and another of how a modern automated organization is functioned.
- Using these pictures conduct a discussion to highlight the following.
- That along with the progress of Information Technology.
  - The tasks of an organization are made easy.
  - Tasks can be performed efficiently with minimum human effort.
  - There is a saving of space in organizations.
  - Profits earned by the organization can be increased.

Suggested instructions for learning:
Let us inquire into how ICT is employed through various areas in the organization
- Out of the three topics on ICT, concentrate on the topic your group has been assigned.
  - Purpose of communication
  - Purpose of disseminating advertisements
  - Purposes of the learning teaching process
- Study the entire reading material and the section assigned to your group, specially.
- Discuss its special features with the other groups.
- Name the area where the topic relevant to you is used.
- Write two examples of each, instance where these areas are used.
- Get ready to present your findings innovatively and co-operatively to the whole class.

<div align="center">**Reading Material**</div>

ICT in Communication

1. Presentation

The process by which the content relevant to a particular topic are presented to viewers using the computer or any other means is called a presentation.

2. Telecommuting

Carrying out office activities through a communication network from home

3. Video conferencing

This is the process by which two or more individuals, located in different places carry out a discussion through network by transmitting audio and video data.

4. ICT in Advertising

They are of three types

1. Product Advertising
2. Business Advertising
3. Service Advertising

5. ICT related to the Learning-Teaching process

1. Computer aided learning.
   Using a computer for teaching as an alternative to the traditional method
2. Computer Based Learning.
   Use of the computer as the main component in the education process.
3. Computer based assessment.
   Use of the computer for assessment purposes.

Aids to understanding subject matter:

- Assign task and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from other groups.
- Lead a discussion to highlight the following.
  - That communication has become easier with the advancement of ICT.
  - That a particular thing can be explained easily to a mass through a presentation.
  - That, due to the advancement of ICT, administration of an organization can be carried out from home, through telecommuting.
  - That, through video / Teleconferencing, both audio and audio visuals can be employed to conduct discussions between several individuals using computer networks.

- That Information Technology can be used in the purchase or sale of a product.
- That Information Technology can be used to advertise a particular business, provide / obtain a particular service.
- That the use of the computer is more effective as a teaching aid than traditional methods of teaching.
- That in computer based learning, the computer can be used as the main component of the learning teaching process.
- That with the development of ICT it is easy to use a computer for assessment work.

Competency Level 1.7:   Evaluates the impact of ICT on society

Number of Periods: 05

Learning Outcomes:
- Names and describes issues created as a consequence of Information and Communication Technology.
- Displays these issues analytically using suitable models
- Highlights the importance of Information and Communication Technology in comparison to other technologies.
- Utilizes models to represent information in concise form.

Learning- Teaching Process

Approach:
- Subject, abuses that have occurred in the use of print, audio and audio-visual media, to discussion by drawing the attention of the class to a newspaper article.
- Conduct a discussion to highlight the following
  - That creations like books, audio and video tapes as well as CD s can be considered as intellectual property.
  - That the breach of ethical responsibility through copying, unauthorized use and sale of such material,can lead to legal complications.
  - That, since the right to intellectual property lies with the author, it is necessary that the author's permission is obtained before such material is copied.
  - That numerous adverse outcomes are brought to society, the economy and the environment, through unauthorized duplication of intellectual property.
  - That technical methodologies have improved with the advancement of computer technology.
  - That computer software too should be used with a sense of responsibility since they are considered intellectual property.

Suggested instructions for learning:
- Out of the three topics below, that come under category of ICT, concentrate on the topic your group has been assigned.
  - Privacy & Piracy
  - Copyright
  - Plagiarism
- Study the reading material entirely and the section assigned to your group, specifically.
- Investigate the material that are advantageous and disadvantageous to society in ICT and classify them appropriately.

- Recall issues that have surfaced as a result of ICT and lead a small group discussion on same.
- Now pay attention to the subject of legal issues that your group has been assigned.
- List what you know regarding this and compare same with the contents of the reading material.
- Inquire into methodologies of overcoming legal issues.
- Subject the importance of ICT in comparison to other instances where computer technology is employed, to evaluation.
- Get ready to present your findings innovatively and co-operatively to the whole class.

Reading Material

How ICT has influenced other technologies?
Electrical Technology
In electrical technology, nowadays generation transmission and trouble shooting tasks are performed most conveniently and effectively, through the use of application software consequent to the development of ICT. The use of embedded systems is growing in popularity today.

Medical Science
At the beginning, once the patient describes his symptoms to the doctor, he arrives at a diagnosis and prescribes medication. But today, the patient can discuss his condition with the doctor using ICT and receive necessary advice as well as treatment. This technology is used extensively at various stages of diagnosing diseases. As a result, today, there is the facility of obtaining the necessary reports both accurately and speedily.

Advantages created by ICT
In certain countries ICT assists indirectly in increasing production. In order to increase the task involving empowerment of production for the improvement of economic relations, both in the private and state sectors, ICT has been of assistance.

E-Commerce
Here there is a visible realization of capital where income is increased and prices are decreased.

E-Government
Saving of money
Increase of efficiency
Increase of transparency in state sectors

E-Education
Increasing employment opportunities. Assist in learning at preferred times through the distant mode, availability of online testing.

Issues created by ICT

Social issues
The impact of ICT on how society is organized and interaction and behaviour between individuals.

Economic Issues
The impact of ICT on the economy.
Computer aided production.

Environmental Issues
The impact of ICT on the Environment.
It has been discovered that there is an incidence of heart diseases and kidney related diseases among people in cities like New York, associated with computer manufacture.
(Source: www.environmental.org , www.cns.org) release of raw material used in ICT as pollutants to the environment

Ethical Issues
The impact of ICT on doing what is right and what is wrong.

Legal Issues
Privacy and Piracy of software

Privacy means the protection of personal information in computer data banks from abuse.
Piracy of software means making of illegal copies of software on which the user has no copyright or any other right
The protection of the rights on new discoveries as well as written and artistic products comes under Intellectual Property Rights
"Patent" means the right provided by the state for a particular period, to the individual or institution, with respect to a particular discovery, invention, written or artistic product. Under this, no other individual has the right to edit , sell or distribute products covered by patent.

Copyright
Copyright is the right of the author to copy, print and market his/her material. Copyright provides protection to the original copy of dramas, music and artistic products, print products, taped sounds, films, broadcasts and computer programs. Only the individual with the right to copy can market, reproduce and distribute the copied software. The consent of the author with the right to copy, should be obtained to transmit software through telecommunication channels or to be copied for exhibition to the public.
The conditions above are relevant with respect to material transmitted over internet or stored on servers and copied, or material provided to other media.

Plagiarism

Passing off the products such as software, hardware, electronic documents or some other person's thoughts and ideas, as ones own.

Licensed software

These, which are protected against copy, belong to the category of intellectual property.

The right devolves on the one releasing the software.

Aids to understanding subject matter:

- Assign task and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from other groups.
- Lead a discussion so as to highlight the following.
  - That the software purchased should be licensed.
  - That the purchaser does not have the right to disseminate copies to others.
  - That copying should not be done without the consent of the author.
  - That the marketing or hire of copied CDs should be avoided.
  - That resource sharing in networks with respect to software should be avoided in the absence of a specific license.
  - That the use of the written presentation of another's idea, song or music, shape in the form of a color, as an animation, or as a picture or other creative product without acknowledgement of source is banned both internationally as well as in Srilanka.
  - That only software with license should be used.
  - That in the installation of licensed software, there is a license agreement. as well as a license number.
  - That legal pressure can be brought to bear on society in this manner in ICT.
  - That, not only legal pressure but this can also bring social, economic, environmental and ethical, pressure to bear upon society.
  - That, nevertheless, there are economic advantages in ICT.

Competency 2: Explores the evolution of computers so as to be able to describe and compare the performance of a modern computer.

Competency Level 2.1: Elicits the significant changes that occurred in computers from generation to generation with greater emphasis on the evolution of processors.

Number of Periods: 05

Learning Outcomes:
- Describes the evolution of processing methods through computer generations until the microprocessor was invented.
- Highlights the technology that investigated the microprocessor in terms of its previous generations.
- Forecasts the future directions of modern computers.

Learning- Teaching Process:

Approach:
- Display a poster containing data processing activities of a spike abacus and a computer to the class.
- Give the opportunity to two volunteers to describe the data processing process of a spike abacus and a computer.
- Conduct a discussion emphasizing the following.
  - That the values represented in a counting frame changes according to the number of beads and their positions in the spokes.
  - That computer data processing is carried out on the basis of the two states of voltage, whether a voltage exists or not.
  - That one has experienced situations where, up to the evolution of the modern processor, adverse side effects have been minimized, speed and efficiency maximized and size optimized in the course of the development of this technology.

Suggested instructions for learning:
- Pay attention to the period your group is assigned, out of the three periods that highlight the evolution of the processor.
  - Pre mechanical era
  - Mechanical era
  - Electro mechanical era
- Study the reading material to identify the technology used in the era related to you.
- Name these technologies.
- Lead a small group discussion to compare the technologies used to process the data during the first 2 generations of electronic eras and the era assigned to your group.

- Out of the generations of the electronic era, name the generation to which the birth of the microprocessor belongs.
- Identify the outstanding characteristics of the micro processor in terms of the period in which it was invented.
- Name, in order, the technologies that formed the basis of the 2nd and 3rd generations of the micro processor and describe the reasons that led to the invention of the modern processor.
- Investigate, the evolution of the processor from the past to the present day in terms of size, cost and technology.
- Analyze all technological changes in relation to the increase in the number of transistors, drop in access time, increase in speed and elimination of adverse side-effects.
- Describe how the microprocessor contributed to the birth of the desktop and portable computers.
- Lead a small – group discussion on the future orientations of the processor.
- Get ready to present your findings innovatively and co-operatively to the whole class.

Reading Material

History of the computer

The history of Information and Communication Technology can be divided into four main eras.

1. Pre mechanical era (before 1450)
2. Mechanical era (1450-1840)
3. Electromechanical era (1840-1940)
4. Electronic era (1940 to date)

- It is evident that the first mathematical calculating device, the Abacus had been used in China around 3000 BC.
- The first mechanical calculator ,the Pascaline was invented by Blaise Pascal in 1642. It could perform only addition and subtraction.
- The German scientist Gottfried Wilhelm Von Liebnitz improved the Pascaline to a state that it could be used to multiply and divide also.The concept of punched cards had been used for this purpose.
- In 1880 Charlse Babage invented the Analitical Engine that could carry out mathematical operations and also store data. It was Charlse Babage who presented the concept of Input, Process and Output that is used in modern computers, for the first time . Therefore, some consider him "The father of the computer". Lady Ada Augesta Lovelace who assisted him is regarded the first programmer.
- The invention of the "Electronic Valve" by Forrest in 1906 laid the foundation to modern computer technology.
- The automatic sequence calculator or otherwise Mark 1 was the first automatic computer invented by Howard Aiken, professor of Harvard University in 1939.

- ENIAC (Electronic Numerical Integrator and Calculator) invented in 1946 is considered the first electronic digital computer.
- EDVAC (Electronic Discrete Variable Automatic Computer) Invented in 1948, is considered the first digital computer that could store programs.
- The first generation of computers ended with the invention of the transistor in 1947. The period 1940-1956 is considered the first generation of computers.
- Computers built using transistors are considered 2nd generation computers.
- In 1964, after the invention of Integrated circuits which were made out of a collection of transistors, computers became small in size, low in price and also it had a high speed. These computers which were made out of ICs are called 3rd genaration computers (1964-1971). In course of time with the advancement of technology silicon chip which was made out of them and of ICs was invented. As a result LSI (Large Scale Integration) and VLSI (Very Large Scale Integration) chips were found.
- During this period, with the development of technology, where thousands of integrated circuits were detached to form a single silicon chip and the Micro Processor was born. While the computers built using them increased in speed and efficiency, there was a drop in size and cost.
- MIT built the ALTAIR 8800 computer in 1975. In 1981 the first personal computer IBM-PC was built by IBM. Following this, the Apple computer Company built the Mackintosh Computer in 1984 setting a landmark in the history of the computer.
- It was possible to build the computer of the fourth generation in such a manner that it was attractive to the user and also incorporated Graphical User Interface (GUI)
- The Apple and IBM companies became quite popular in the development of personal computers. The processor provider of the IBM Company was the Intel Company.
- The other organizations that produce processors are Intel®, Cyrix®, IDT®, AMD® and Motorola®.

Future directions of computer technology.

The anticipation of present day scientists is to build a computer that perform functions of an intelligent human. In computer science this particular field is called Artificial Intelligence. Man has the ability to involve himself in complex activities like concentrating on different traits of thought at the same time, and to distinguish between different voices. Robot technology and the construction of automatic vehicles based on artificial intelligence, are technologies already in place.

While the concept of the molecular computer / DNA computers and biological computers are already in process they will be a reality in the future. Further, the development of a quantum computer by 2015 is one aim of the scientists. These are considered objectives of the fifth generation computers.

Evolution of the processors

Model (Intel)	Model (Motorola)	Year	Speed (MHz)
8088			8
8086	68000		4-8
80186	68010		16
80286	68020	1982	20
80386	68030	1986	40
80486	68040	1990	66-75
Pentium MMX	Power PC	1997	166/200
Pentium II	Power PC G3/G4	2000	1200
Pentium III		2001	1800-3800
Pentium IV		2004	1600-2500
	Power PC G5	2007	4200-

The Transistor

Before the invention of transistors, electronic valves were used in the construction of computers. Since a lot of heat was emitted problems arose due to burning out of valves. A circuit built by assembling several transistors was called a chip. By using chips it was possible to overcome the above problems. In this chip there are a large number of circuits built by using semiconductor technology.
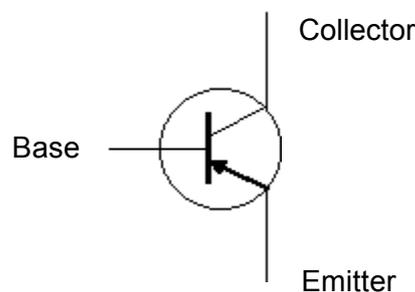
Transistor and its terminals

Specification of a Processor

Bus

The physical path along which data travels as signals within the components of a computer or within the components between computers is called a Bus.

There are three main verities of bus on the motherboard.

1. **Data Bus**

   The bus carrying Data from one place to another is called a data bus.

2. **Address Bus**

   A particular location is selected in order to read the data in the memory or write data into memory. The address of this location is known as the address bus.

3. Control Bus

Control signals are carried to various locations in the computer by the control bus.

Registers

The location where signals of the Arithmetic and logic unit are stored temporarily is called registers.

Clock speed of a CPU

The speed at which instructions provided to a processor is implemented, is called the clock speed of the CPU. The CPU of a modern computer is measured in MHz or GHz

Word Size

The number of bits in a machine language word used in a computer is called its size or its word length.

Classification of computers

There are several ways of classifying computers
1. According to size
2. According to technology used
3. According to purpose of use

1. Classification of computers According to size
- Super Computers
- Mainframe Computers
- Mini Computers
- Micro Computers

2. Classification of computers According to technology used
- Digital Computers
- Analog Computers
- Hybrid Computers

3. Classification of computers According to purpose of use
- General Purpose
- Special Purpose

Personal Computers that fall into the category of Micro Computers are as follows.
- Desktop Computers
- Workstations
- Laptop Computers
- Palmtop Computers

- Notebook Computers
- Personal Digital Assistant (PDA) or Digital Diary
- Pocket Computers

Aids to understanding subject matter:
- Assign task and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from the other groups.
- Lead a discussion so as to highlight the following.
  - That the first mathematical device, the Abacus, was discovered by the Chinese around 3000 BC
  - That the history of the computer can be divided into the pre mechanical age, mechanical age, electro-mechanical age and electronic age
  - That the technology used with the four generations of the electronic era are respectively vacuum tube, Transistor, Integrated circuits and the Microprocessor.
  - That, with the development of technology thousand of integrated circuits were fabricated on a silicon chip and the micro processor was constructed.
  - That semi conductor technology was used in the construction of chips.
  - That the Central Processing Unit can be treated as the combination of Arithmetic and logic unit, Registers and Control unit.
  - That, it is the data and instructions received a little while ago, which is to be delivered to Arithmatic & Logic Unit and also processed data which is to be sent to main memory are temporarily stored in the registers.
  - That the path connecting the CPU of a computer with other components is called the "Bus".
  - That there are three main buses namely , data bus, address bus and control bus
  - That the structure of the bus used, word size and clock pulses are factors that affect the efficiency of a computer.
  - That computers can be classified in terms of size as Super, Mainframe, Mini and Micro.
  - That, according to the technology used computers can be categorized as digital, analog and hybrid.
  - That there are several types of processors manufactured by Intel, Motorola and AMD
  - That the clock speed of the processor has gradually increased.
  - That the clock pulse speed of processors is measured in MHz or GHz units.
  - That semiconductor technology is used in making chips.
  - That the following are included in the specification of a processor.
    - Number of transistors
    - Data Bus, Address Bus and Control Bus
    - Clock speed of the CPU

- Number of registers
- Cache Memory
- That the aim of the fifth generation is to develop and explore the possibility of people and machines working together

Competency 3: Investigates how data are represented in computers and exploits them in arithmetic and logic operations.

Competency Level 3.1: Analyzes how numeric data are represented in computers.

Number of Periods: 05

Learning Outcomes:
- Tabulates numbering systems and their components.
- Represents the same number using different number bases.
- Identifies the number system of a given number and represents it in different number systems.
- Uses logic for purposes of number conversion.
- Creates tables that show how digital data are represented in a computer.

Learning- Teaching Process:

Approach:
- Get examples of integers from class.
- Give the opportunity to four volunteers to complete the tables below given on the black board and rewrite the relevant numbers as exponents.

Decimal numbers system

Numbers	
75	
750	
7500	
7.5	
0.75	

Weighing Factor	10^2	10^1	10^0	10^{-1}	10^{-2}	10^{-3}
Positional Values						

Number 415.25

Binary numbers system

Weighing Factor	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}
Positional Values						

Number 111.001

Octal number system

Weighing Factor	8^2	8^1	8^0	8^{-1}	8^{-2}
Multiplicative Factor					
Positional Values					

Number 345.125

Hexa decimal number system

Weighing Factor	16^2	16^1	16^0	16^{-1}	16^{-2}
Number					
Positional Values					

Number 537

Decimal Numbers	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hexa Decimal Numbers																

- Conduct a discussion to highlight the following.
    - Decimal numbers.
    - That Decimal Numbers could be signed or unsigned.
    - Integers are a number set.
    - While the fractional part and the integer part of a decimal number are separated by a decimal point, the number is superimposed by a Plus"+" sign or negative"-"sign.
    - That a number has a base.
    - That where the base of a number system is "r" it has an "r" number of symbols.
    - That the decimal point exists in the same position when using fixed point numbers.
    - That in calculating with large numbers, use of floating point numbers is more advantageous than using fixed point numbers.
    - That a floating point number where the base is "r" Mantissa is "a" and the Exponent is "e" can be written as below.
      $$a \times r^e$$
    - That a Hexadecimal number system is built by using of symbols from 0 to 9 and letters A,B,C,D,E and F.
    - That a number has a positional value.
    - That data are manipulated through values of "0" and "1" in computers.
    - That a unique symbol set with the ability to represent any value belongs to a number system.
    - That the same number can be represented through different number systems.

Suggested instructions for learning:

Let's inquire into methods of representing computer related numerical data.

- Pay attention to the conversion relevant to your group out of the four conversions below.
  - Decimal Numbers convert as ⟶ Binary, Octal and Hexadecimal
  - Binary Numbers convert as ⟶ Octal and Hexadecimal
  - Octal Numbers convert as ⟶ Decimal, Binary and Hexadecimal
  - Hexadecimal Numbers convert as ⟶ decimal Binary, and Octal
- Fill tables assigned to your group and become thorough about number systems.
- Decimal ⟶ Binary

Powers of 2	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	Total
Value	128	64	32	16	8	4	2	1	
Binary Numbers									1
									5
									15
									178

- Decimal ⟶ Octal

Powers of 8	8^4	8^3	8^2	8^1	8^0	Total
Value	4096	512	64	8	1	
Octal Numbers						1
						5
						15
						178

- Decimal ⟶ Hexadecimal

Powers of 16	16^3	16^2	16^1	16^0	Total
Value	4096	256	16	1	
Hexadecimal Numbers					1
					5
					15
					178

- Binary ⟶ Decimal

Binary	Decimal
1010	
1000	
100100	
111101	

- Binary ⟶ Octal

Binary	As 3 Bit Groups	Octal Value
1010		
1000		
100100		
111101		

- Binary ⟶ Hexadecimal

Binary	As 4 Bit Groups	Hexadecimal Value
1010		
1101		
11110		
11111		

- Octal ⟶ Decimal

Octal	Decimal
35	
43	
73	
61	

- Octal ⟶ Binary

Octal	As 3 Bit Groups	Binary
27	010,111	010111
62		
75		
47		

- Octal ⟶ Hexadecimal

Octal	Binary	As 4 Bit Groups	Hexadecimal
35	011,101	0001,1101	1D
47			
72			
77			

- Hexadecimal ⟶ Binary

Hexadecimal	As 4 Bit Groups	Binary
AB2	1010,1011,0010	101010110010
ABF		
5AB		
4AF		

- Hexadecimal ⟶ Decimal

Hexadecimal	Decimal
1A2	
5FB	
ABB	
9AC	

- Hexadecimal ⟶ Octal

Hexadecimal	As 4 Bit Groups	As 3 Bit Groups	Octal
A2B	1010,0010,1011	101,000,101,011	5053
34A			
F8A			
57A			

- Be prepared to present your findings creatively and co-operatively to the entire class.

Reading Material

Decimal Number System

- The number system extremely close to our day to day life.
- It is made up of the symbols 0,1,2,3,4,5,6,7,8,9
- It is called the decimal number system because ten numbers belong to this number system.
- It can be believed that it has become a popular number system because humans have ten fingers in their hands.
- However large a number is it can be represented using these ten symbols. It's base is 10
- While the decimal part and the whole part of a number are separated by a decimal point, a Plus"+" sign or negative"-"sign. is placed before it.

Ex: + 10.235

       - 25.321

Integers

- Integers are a number set.
- Natural numbers (0,1,2,3,……) and (0,-1,-2,-3,…) are Integers.
- Neither decimal numbers nor fractions are integers.

Ex: 5, 75, -85

Fixed point Numbers

- In calculations involving fixed point numbers a fixed number of symbols is used after the decimal point.

Integer Arithmetic	Fixed point Arithmetic
(i)	(ii)
7632135	763.2135
1794821	179.4821
9426956	942.6956

In (i) integers are used.

In (ii) fixed point numbers are used. The decimal point is located in the same position.

Floating point arithmetic

- This method is used in computing large numbers and in storing.
- In this method, it is not necessary that the decimal point should occupy the same position.

Ex   :   650   = 6.5×10^1

                6500   = 6.5×10^2

                65.5   = 6.5×10^3

                65   = 6.5×10^{-1}

                0.65   = 6.5×10^{-2}

- The floating point number can be written as follows.

    a x **r^e**

    a - is called the mantissa

    r - is the base (radix)

    e - is called the exponent

In the example above

650 = 6.5×10^1

65- is called the mantissa

10 - is the base

1 - is called the exponent

Addition of Floating point numbers

- A = 123456.7

  B = 567.89

  A + B = ?

• Arrange the first two numbers (A and B) so as to get the same exponent

A = 123456.7 = 1.234567×10^5

B = 567.89 = 5.6789×10^2

$\qquad\qquad\qquad\quad$ = 0.0056789×10^5

A = 1.2345670×10^5

B = $\underline{0.0056789 \times 10^5}$

$\qquad$ 1.2402459×10^5

Symbol value and positional value

1235 =	1×10^3	=	1×1000	=	1000
	2×10^2	=	2×100	=	200
	3×10^1	=	3×10	=	30
	5×10^0	=	5×1	=	$\underline{5}$
					1235

In order to calculate the value of a number in terms of its position it should be multiplied by weighing Factor.

1235 = 1000 + 200 + 30 + 5

Positional Value

Weighing Factor
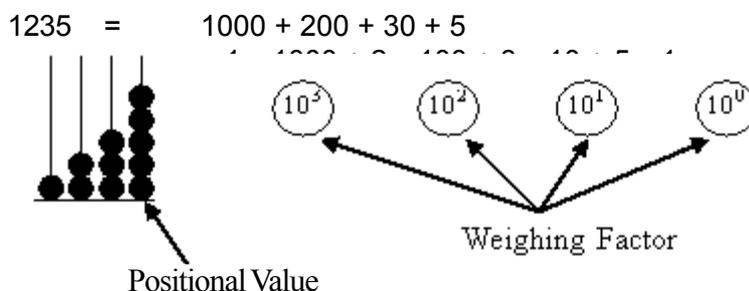
Decimal number system

The number set to which this number system belongs

0, 1, 2, 3, 4, 5, 6, 7, 8, 9

In the process of computing, when the value of a particular number exceeds the largest number 9 in that number set, the multiples of 10 of the number of values are transferred to the next (Left) positional value. Every positional value is multiplied by 10.

Ex: 3456   = $3 \times 10^3 + 4 \times 10^2 + 5 \times 10^1 + 6 \times 10^0$

   =   3000 +   400 + 50 + 6

   =   3456

Binary number system
- As the computer works on electricity, its functions are controlled by two states.
- These two states are, where power is ON and OFF (As two different levels of voltage)
- These two states are represented by symbols "0" and "1".
- Therefore, a number system with two digits can be used here.

Since the 2 is the base of the binary number system the power of 2 is considered.

2^4 2^3 2^2 2^1 2^0

16   8   4   2   1

Then the value of decimal numbers can be expanded as follows.

Decimal	Binary
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
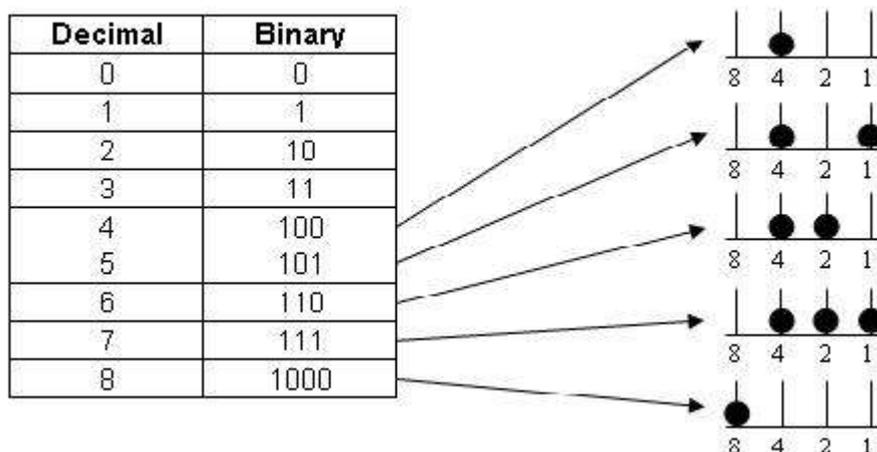
Octal number system

- The base is 8.
- Contains symbols 0,1,2,3,4,5,6 and 7 as digits.
- The minimum is 0 and the maximum is 7.

Weight	8^2	8^1	8^0	.	8^{-1}	8^{-2}
Positional Value	64	8	1	.	0.125	

Hexadecimal number system

- The base is 16.
- Contains symbols 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E and F.
- The minimum value is 0 and the maximum is 15.
- The values represented by the symbols are as follows.

Decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hexa Decimal	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

The decimal number 785.43 can be tabulated as follows.

	100	10	1	1/10	1/100	
Weight	10^2	10^1	10^0	10^{-1}	10^{-2}	
Numbers	7	6	5	4	3	
Positional Value	700	60	5	0.4	0.03	765.43

Most Significant Digit (MSD) and the Least Significant Digit (LSD)
MSD
The digit that contains the most positional value in a number.

LSD
The digit that contains the least positional value in a number.

Ex:
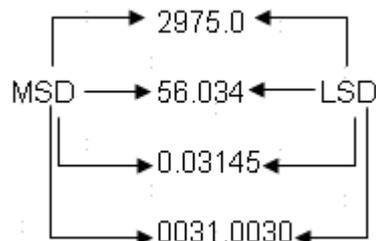
Conversions between number systems

1. Conversion of a binary number into a decimal number.

   110101.00_2 ⟶ Decimal

Binary Value	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	
Positional Value	32	16	8	4	2	1	0.5	0.25	
Binary Number	1	1	0	1	0	1	1	1	
Decimal Value	32	16	0	4	0	1	0.5	0.25	53.75

By adding all the numbers after multiplying each and every digit in the binary number with its relevant place value, the corresponding decimal value of that number is found.

110101.00_2 ⟶ 53.75_{10}

2. Conversion of a Octal number into a decimal number

   (237.04_8) ⟶ Decimal

Octal Value	8^2	8^1	8^0	8^{-1}	8^{-2}	
Positional Value	64	8	1	0.125	0.015625	
Octal Number	2	3	7	0	4	
Decimal Value	128	24	7	0	0.0625	159.0625

$237.04_8 = 159.0625_{10}$

3. Conversion of a Hexadecimal number into a decimal number

   $(1AB2_{16})$ ⟶ Decimal

Hexa Decimal Value	16^2	16^1	16^0	16^{-1}	
Positional Value	256	16	1	0.0625	
Hexa Decimal Number	1	A	B	2	
Decimal Value	256	160	11	0.125	427.125

$(1AB2_{16}) = 427.125_{10}$

1. Let's convert decimal numbers into binary numbers.
    a. Divide the given decimal number by 2.
    b. Write the integer answer (quotient) under the long division symbol.
    c. Write the remainder (0 or 1) to the right of the dividend.
    d. Continue downwards, dividing each new quotient by two and writing the remainders to the right of each dividend. Stop when the quotient is 0.
    e. Starting from the bottom, write the sequence of 1's and 0's upwards to the top.

Ex: Converting 27_{10} into a Binary number

```
2 |27
2 |13    1      ↑
2 |6     1      |
2 |3     0      |      27₁₀ = 11011₂
2 |1     1      |
   |0    1
```

$$27_{10} = 11011_2$$

2. Let's convert decimal numbers into Octal numbers.
    a. Divide the given decimal number by 8.
    b. Write the integer answer (quotient) under the long division symbol.
    c. Write the remainder (0 to 7) to the right of the dividend.
    d. Continue downwards, dividing each new quotient by 8 and writing the remainders to the right of each dividend. Stop when the quotient is 0.
    e. Starting from the bottom, write the sequence of remainders upwards to the top.

Ex: Converting 245_{10} into a Octal number

```
8|245
8| 30    5      ↑
8|  3    6      |
    0    3      |      245₁₀ = 365₈
```

$$245_{10} = 365_8$$

3. Let's convert decimal numbers into Hexadecimal numbers.
    a. Divide the decimal number by 16. Treat the division as an integer division.
    b. Write down the remainder (in hexadecimal, ie. if the remainder is 12, write down "C").
    c. Repeat step a and b until result is 0.
    d. The hexadecimal value is the digit sequence of the remainders from the bottom to top.

Ex: Converting 3240_{10} into a Hexadecimal number

```
16|3240
16| 202    8  ↑
16|  12   10  |
      0   12  |          3240₁₀  = CA8₁₆
```

$3240_{10} = CA8_{16}$

Fractions to binary

a.   Multiply the given decimal fraction by 2.

b.   Multiply by 2 until the decimal part becomes 0.

c.   Write the values in front of decimal point from begining to end.

Ex: 0.3125_{10} ⟶ 0.0101_2

	0.3125	× 2
0	.625	× 2
1	.25	× 2
0	.50	× 2
1	.00	

Fractions to Octal

a.   Multiply the given decimal fraction by 8.

b.   Multiply the decimal by 8 until it becomes 0.

c.   Write from the beginning to end, the values in front of the decimal point.

Ex: 0.3125_{10} ⟶ 0.24_8

0	0.3125	x 8
2	0.50	x 8
4	0	x 8

Conversion of octal numbers into binary numbers.

Octal Number	Binary Number
0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

- The Binary value of every octal number from 0 to 7 can be written in three digits as above.
- When the binary value of every digit in an octal number written in three digits is substituted, it is converted into the binary number of that octal number.
- 12_8 = $001, 010_2$

  65.12_8 = $(110, 101.001, 010)_2$

Conversion of a binary number into a octal number
- First, beginning from the decimal point of the binary number form groups of three numerals each starting from the decimal point moving left.
- If a group has less than three numerals add a "0" in front to form a group of three numerals.
- In making the fractional part octal, form groups of three numerals each, moving right from the decimal point.
- If the number of numerals in a group is less than three add a "0" to the end and complete the group.
- Write the octal number relevant to each group.

Ex:

I. $(010101)_2$ $\longrightarrow$ Octal

    010   =   2

    101   =   5

    $(010101)_2$ = $(25)_8$

II. $(0.110111)_2$ $\longrightarrow$ Octal

    110   =   6

    111   =   7

    $(0.110111)_2$ = $(0.67)_8$

III. $(1101.11)_2$ $\longrightarrow$ Octal

    $(001101.110)_2$ = 15.6_8

Conversion of Hexadecimal numbers into binary numbers

Decimal	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

- Every Hexadecimal number 0 to 15 can be written in four binary numbers as shown above.

- When the binary value of every digit in a hexadecimal number written in four digits is substituted, it is converted into the binary number of that hexadecimal number.

Ex: $(A4)_{16}$ = $(1010, 0100)_2$

   $(B7.12)_6$ = $(1011, 0111.0001, 0010)_2$

Conversion of Binary numbers into Hexadecimal numbers

- First, group the binary numbers into groups of four digits each, starting from the decimal point and moving left.
- If the number of numerals in a group is less than four, place a "0 " in front and form a group of four.
- In converting fractional part into hexadecimal numbers, form groups of four, starting from the decimal point and moving right.
- If the number of numerals in a group is less than four place a "0 " behind and form the group.
- Write the decimal number relevant to each group.
- Afterwards, write the decimal numbers in hexadecimal numbers.

Ex: (i) 101011_2

0010,1011

2   11

2   B

$2B_{16}$

Aids to understanding subject matter:
- Assign task and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from the other groups.
- Review, to highlight the following.
  - That in the conversion of a decimal number system to another number system.
  - The whole number part should be divided by the base of the number system .
  - The fractional part should be multiplied by the base of the number system.
  - In converting another number system to the decimal number system, the numbers are obtained by the addition of the numbers derived through the multiplication of the numbers by the relevant place value.
  - That any number system can be converted into any other number system.

Competency 4:   Uses logic gates to design basic digital circuits and devices in computers.

Competency Level 4.1:   Analyzes basic digital logic gates in terms of their unique functionalities.

Number of Periods: 04

Learning Outcomes:
- Shows basic logic gates and complex logic gates using symbols.
- Explains the behaviour of these logic gates by means of truth tables.
- Draws logic circuits to explain how complex logic gates have been created.
- Reads circuits and diagrams with understanding.

Learning- Teaching Process:

Approach:
- Exhibit three truth tables containing only the inputs relevant to the logic gates NOT , OR, and AND.
- Give the opportunity to three volunteers to complete the output rows of these tables and to explain to the class what they have done.
- Conduct a discussion to highlight the following.
- That while there is a single input to the NOT logic gate, there are more than one inputs to AND and OR logic gates.
- That the number of combinations relevant to "n" inputs is shown by **2^n**.
- That there is only one output for any logic gate.
- That, apart from these logic gates ,there is another basic logic gate and three other logic gates made by the combination of these logic gates.

Suggested instructions for learning:
Out of the circuits below pay attention to the circuit assigned to your group.

45
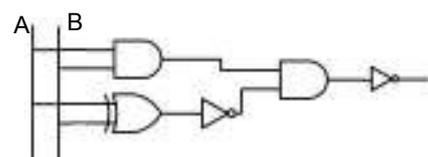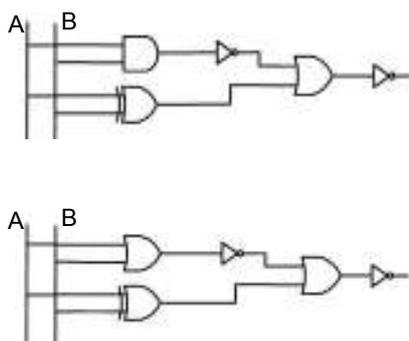
- Study well the part of the circuit you have got and identify the gates AND, OR and NOT separately.
- Study the reading material in order to identify the basic logic gate which is included in the circuit, that you have not yet, studied.
- Study the action of basic logic gates using the Electronic Project Board.
- Identify the situations where one combined logic gate can be applied in place of the two basic logic gates to the given circuit.
- Draw that part of the circuit again using the combinational gates.
- Study the action of the combined logic gates by using the electronic project board.
- Write a Boolean Expression to show the output when inputs A and B are applied.
- Confirm output by constructing the circuit using an Electronic Project Board.
- Get ready to present the findings of your group creatively and co-operatively to the entire class.

Reading Material

Logic gates and the relevant truth tables

Components that perform logic operations to provide single output for one or more logic inputs are called logic gates. Boolean logic is used here. Practically, Diodes and Transistors are used to manufacture electronic components of logic gates. Further, these logic gates can be manufactured mechanically as relays.

Truth Tables

A type of table that describes the behaviour of logic gates. A truth table can be defined as a list of all input, combinations and the relevant outputs of the logic gates.

Logic Gates

1. **NOT Gate (Logical Negation / Inverter)**

A	$F=\overline{A}$
0	1
1	0
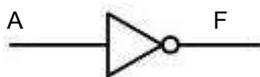
Symbol   Truth Table

When logic input is true, logic output is false, when logic input is false, logic output is true.

Hex Inverter - IC

Logic Family – TTL
Package – DIP
7404PC
74S04PC
74LS04PC
Vcc = 5V
TA = 0°C to 70°C
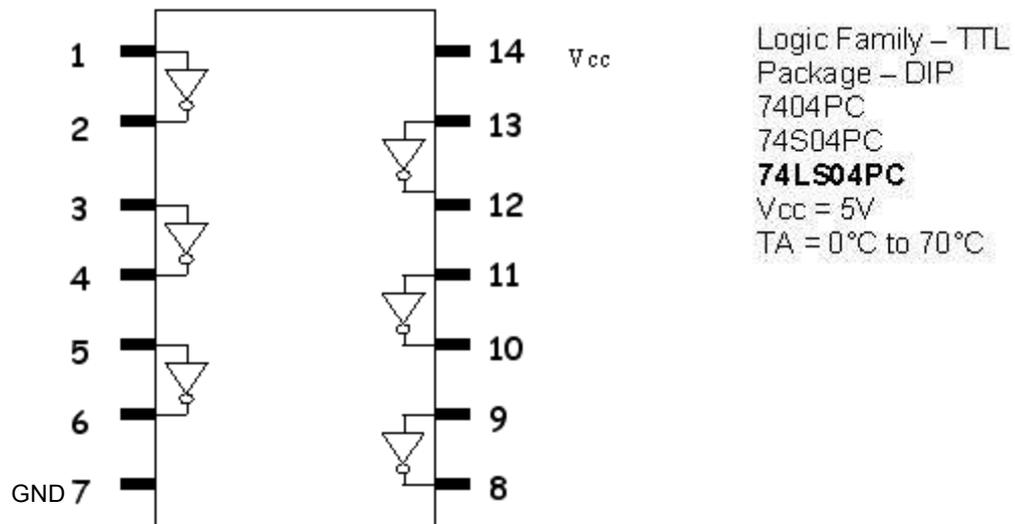
By constructing the above circuit on an Electronic Project Board, using an Integrated circuit (IC), light emitting diode and a power supply, the action of a NOT gate could be studied.
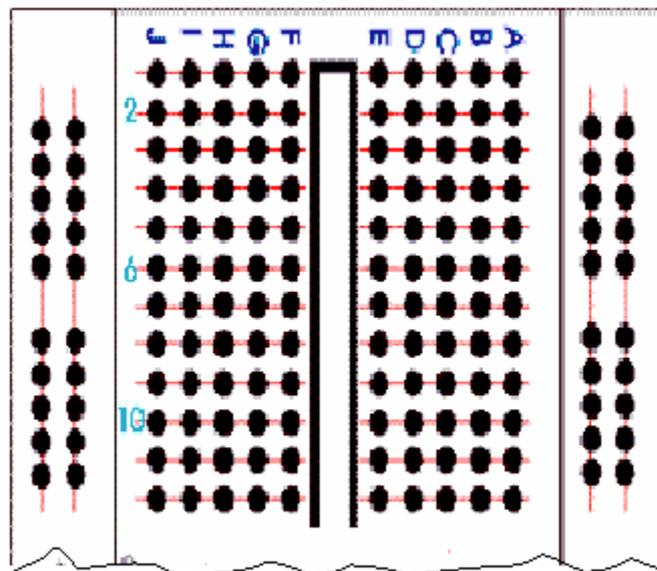
Electronic Project Board

2. OR Logic Gate

Only when both A and B logic inputs are false, the logic output F is false. Logic output is true for all other cases.
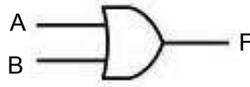
Symbol

A	B	F=A+B
0	0	0
0	1	1
1	0	1
1	1	1

Truth Table
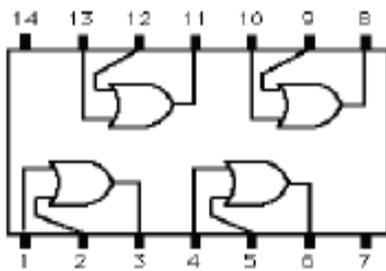
7432 Quad 2-Input OR Gate

By building the above circuit on an Electronic Project Board using an Integrated Circuit, light emitting diode and power source, the action of an OR gate could be studied.

3. AND Logic Gate
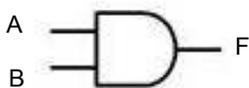
Symbol

A	B	F=A.B
0	0	0
0	1	0
1	0	0
1	1	1

Truth Table

Only if all logic inputs are true logic output is true .Logic outputs are false in all other instances.
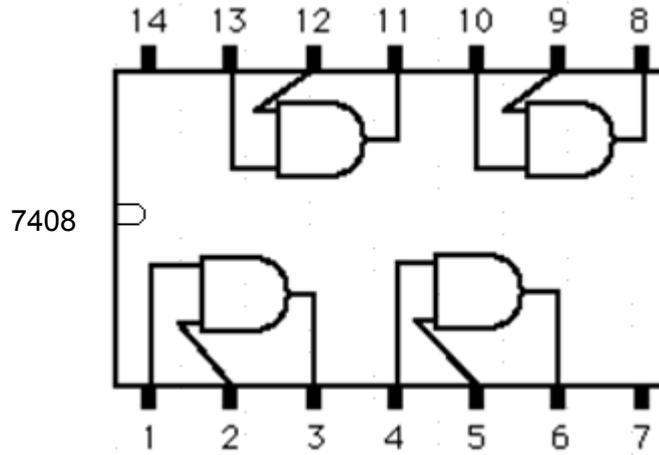
7408

By building the above circuit on an Electronic Project Board using an Integrated Circuit, light emitting diode and power source, the action of an AND gate can be studied.

4. XOR Logic Gate

A
B
F
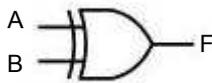
Symbol

| A	B	F=A⊕B
0	0	0
0	1	1
1	0	1
1	1	0

Truth Table

When logic inputs are equal, logic output is false and when the two Logic inputs are not equal the output is true.
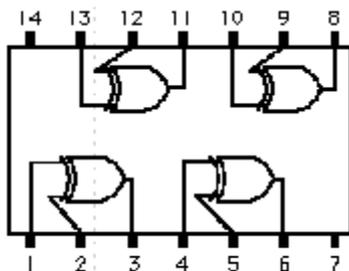
By building the above circuit on an Electronic Project Board using an Integrated Circuit, light emitting diode and power source, the action of an XOR gate can be studied.

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Combinational Logic Gates

When the NOT gate which is a basic logic gate, is combined separately with other three basic logic gates, combinational logic gates are formed.

1. NOR Gate
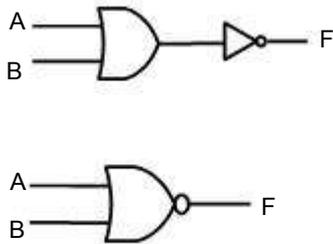
A	B	$F=\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

Symbol   Truth Table

The output of this gate is the negation of the output of the OR logic gate.
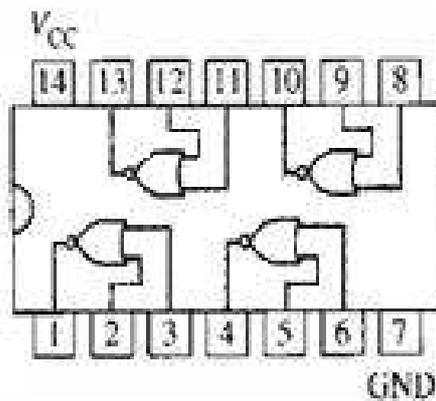
7402/74LS02

By building the above circuit on an Electronic Project Board using an Integrated Circuit, light emitting diode and power source, the action of an NOR gate can be studied.

2. NAND Gate
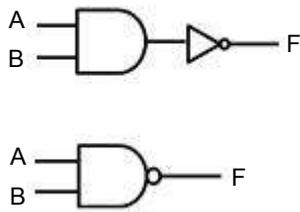
| A	B	F=Ā.B̄
0	0	1
0	1	1
1	0	1
1	1	0

Symbol   Truth Table

The output of this gate is the negation of the output of theAND logic gate.
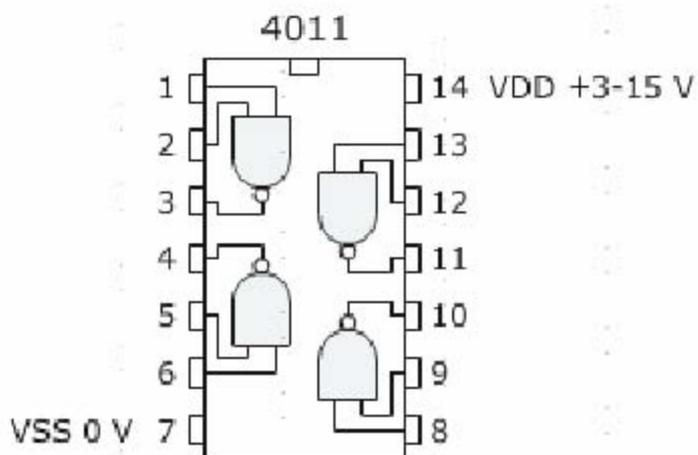
By building the above circuit on an Electronic Project Board using an Integrated Circuit, light emitting diode and power source, the action of an NAND gate could be studied.

3. X NOR Gate
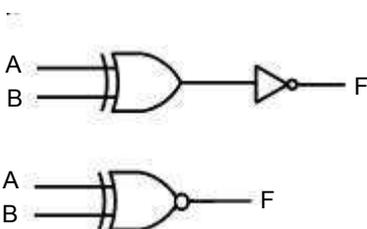
A	B	F=A⊕B
0	0	1
0	1	0
1	0	0
1	1	1

Symbol   Truth Table

The output of this gate is the negation of the output of XOR logic gate.
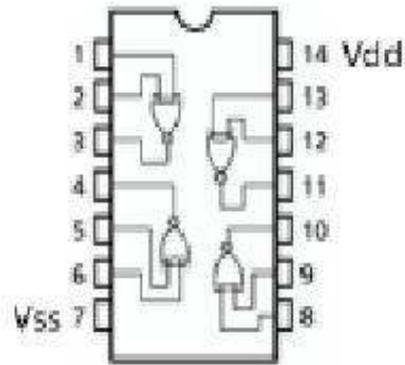
By building the above circuit on an Electronic Project Board using an Integrated Circuit, light emitting diode and power source, the action of an XNOR gate can be studied.

Aids to understanding subject matter:
- Assign task and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from other groups.
- Lead a discussion to highlight the following.
  - That the four basic logic gates perform four different tasks.
  - That output can be confirmed by creating the circuit using an Electronic Project Board and a suitable integrated circuit.
  - That the outputs relevant to various combinations of inputs of logic gates can be described using truth tables.
  - That the unified logic gates NAND, NOR and XNOR are created by combining the basic logic gates AND, OR and XOR with NOT gate.
  - That there is a specific symbol to represent every logic gate.
  - That the negation of the outputs of the logic gates. AND, OR and XOR is the output of the unified logic gates NAND, NOR and XNOR.

Competency 7:   Uses programming language to give instructions to the computer to solve problems.

Competency Level 7.3:   Uses the algorithmic approach to solve problems.

Number of Periods: 05

Learning Outcomes:
- Uses a sequential method to solve a problem.
- Writes out how a problem that should be solved step by step, at a higher level and defines as an algorithm.
- Uses flow charts and pseudo codes in order to present an algorithem in unstructured form.
- Writes an algorithm in structured form using pseudo code and facilitates development of a computer program.

Learning- Teaching Process

Approach:
- Discuss with students how money is withdrawn from an account using an Automated Teller Machine.
- Get the students to describe, in order, the steps followed.
- Conduct a discussion to highlight the following.
  - That there are methodologies to be followed step by step, in solving various problems
  - That such a methodology is called an algorithm.
  - That flow charts are used in order to present an algorithm in an unstructured form and pseudo codes are used to present it in structured form.
  - That the preparation of a computer program facilitates presentation of an algorithm in structured form.

Suggested instructions for learning:
- Concentrate on the reading material given to you.
- Pay attention to the problem assigned to your group, from the three below.
  - Obtain marks for four subjects and get their total as well as the average. If the average is over 50 award "Pass" and "Fail" if less than 50.
  - In a business organization the following discounts are given on purchases made. If the total value is over Rs. 5000 a discount of 10% and the discount is 5% if the total value is less. Obtain the total value and output the discount.
  - The following commissions are paid to the employees of a business organization drawing a permanent salary of Rs. 8000 per month. If the total of sales by an employee has exceeded Rs. 50,000.00, he is entitled to a commission of 25% and 10% if less than Rs. 50000. Obtain the total value of the sales made by an employee and calculate his monthly salary.

- Study the problem assigned to you well and prepare an algorithm to solve it.
- After that, prepare a flow chart based on it, to solve the problem.
- Based on the flow chart write the pseudo code relevant to its solution.
- Lead a small group discussion in order to confirm the answers of your group.
- Get ready to present your findings innovatively and co-operatively, to the whole class.

Reading Material

In day to day life we face various problems. We find solutions for them in different ways.

In order to solve a problem using a computer it is necessary to write a program. Before writing the program if the steps to be followed in solving the problem is written, it becomes easy to understand the solution. The solution written step by step in this manner is called an algorithm. Tools are used to present an algorithm written in this manner. They are

1. Flowcharts
2. Pseudo codes

Flowcharts

Flow charts are used in presenting an algorithm graphically in unstructured form. For this purpose the graphic symbols below are used.

- Start / End

  Ex:

  Start

  End
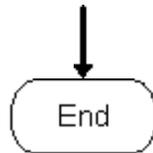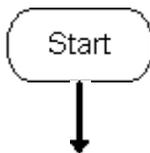
  - Used to show the beginning and end of a flow chart.

- Process

  Ex:

  Total = a+b
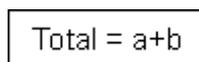
  - Used to show a method of preparing data.

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- Input/Output

  Ex:

  Input a

  Display Total
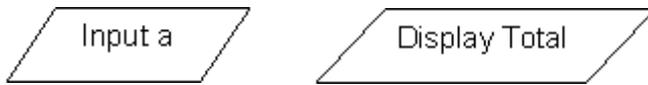
- Used to show data input and output.

- Decision

  Ex:

  a>b Yes →

  ↓No
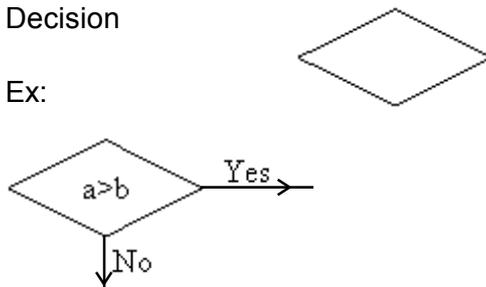
- Used to represent decisions.

- Sub Process
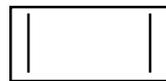
- Used to represent process other than the main process.

- Flow Lines
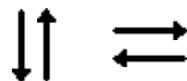
- Used to join graphical symbols together and the direction of flow.

- Connector



- Used to represent the joining of parts of flow charts.

Example1

Obtain two numbers different from each other and output the greater number.
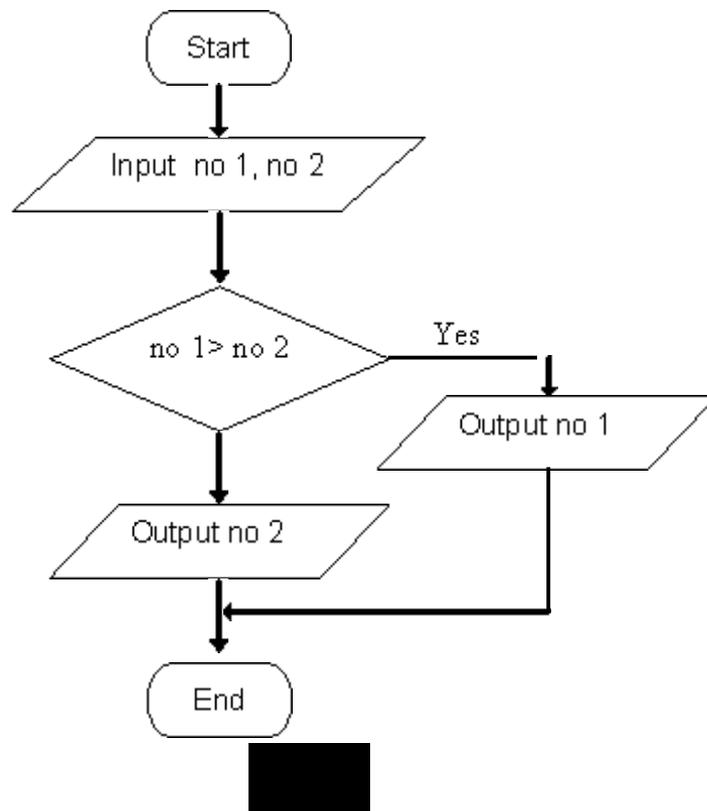
Example2

Obtain five numbers and output their sum.
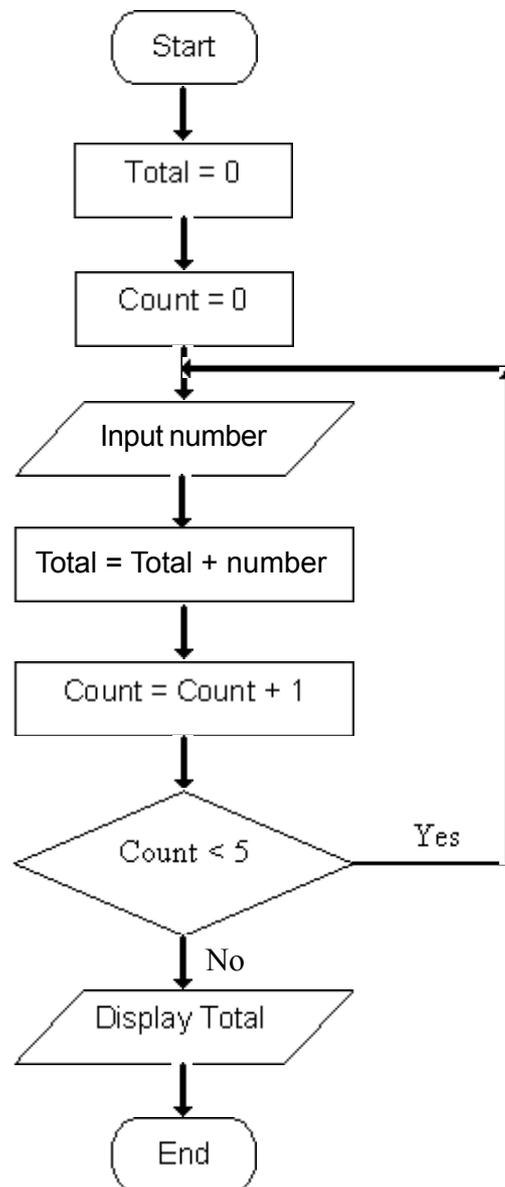
Pseudo codes

Pseudo codes are used in order to make it easier for the algorithm to be understood by the programmer when writing a computer program. Here, a series of instructions using the words in the English Language is prepared. Although these words are not those used in any programming language they show similarity to a great extent. The following expressions are used here.

1. **Selection statement**

    If Then Statement

Example

    If marks > 50 Then

    Display "Pass"

    Else

    Display "Fail"

    Endif

2. **Repetitive Statement**

    These statements are used for the repetition of a particular set of instructions.

a. **Repetition of For Next**

    This expression is used for the repetition of a particular set of instructions a fixed number of times.

Example

Obtaining the sum of a 10 numbers

    For Count = 1 to 10

    Input num

    Total = Total + num

    Next Count

b. **Repetition** of **While Do**

    This expression is used for the repetition of a particular set of instructions an unknown number of times. In this instance a particular condition is examined at first and this is repeated as long as it is held true.

Examples

Obtain a group of numbers and get their sum. (Stop repetition after a negative number is obtained)

> **While num > 0 Do**
>   **Input num**
>   **Total = Total + num**
> **End While**

c. Repeat until

This expression is used to repeat a particular set of instructions an unknown number of times. Here, a particular condition is examined at the end of the section that needs to be repeated and is repeated until it continues to be untrue.

Examples

Get a set of numbers greater than zero and find their sum. (When zero is produced the loop stops)

> **Repeat**
>   **Input num**
>   **Total = Total + num**
>   **Until num < 0**

Let's write using pseudo code for examples written using flow charts

Example1

> **Input num1, num2**
> **If num1 > num2 Then**
>   **Display num1**
> **Else**
>   **Display num2**
> **End if**

Example2

a. Using **For next** Statement

Total = 0

For count = 1 to 5

  Input num

  Total = Total + num

Next Count

Display Total

b. Using **While do** Statement

Total = 0

Count = 0

While count < 5 Do

  Input num

  Total = Total + num

  Count = Count + 1

End while

c. Using **Repeat Until** Statement

Total = 0

Count = 0

Repeat

  Input num

  Total = Total + num

  Count = Count + 1

Until Count = 5

Display Total

The examples above show that the expression **while** do and the expression **repeat until** can be used in place of the expression **For Next**.

Aids to understanding subject matter:

- Assign task and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from the other groups.
- Lead a discussion so as to highlight the following.
    - That there is a methodology to be followed step by step in solving a particular problem.
    - That it is necessary to use such methodologies in writing a program to solve a problem using computers.
    - That the steps to be followed in solving a problem written at high level is called an algorithm.
    - That flowcharts can be used to present an unstructured algorithm using graphic symbols.
    - That in order to present an algorithm in structured form for the programmer to understand it better, pseudo codes are used.
    - That there are standard symbols and words for the flow charts and pseudo codes above.
    - That at the end, solutions presented in various ways, can be converted to computer programs by using programming languages.

Competency 9:   Designs and develops database system to manage data efficiently and effectively.

Competency Level 9.1:   Compares and contrasts different types of database models in terms of their features.

Number of Periods: 05

Learning Outcomes:
- Correctly defines a data base system.
- Names models of various data bases.
- Describes the difference between traditional data bases and computerized data bases.
- Presents descriptions of various data bases encountered in the environment.
- Classifies these systems in terms of different models.

Learning - Teaching Process:

Approach:
- Lead a discussion with students on how clothes are arranged in a wardrobe.
- Accordingly get the students to arrive at the conclusion that clothes are arranged in a formal manner in a wardrobe and that a particular method is employed in that regard.
- Lead a discussion to highlight the following.
    - That a similar method is adopted in the arranging of different articles in different locations.
    - That similar methods are used by various organizations to store information.
    - That an information system maintained systematically using a similar method is called a data base.
    - That traditional data bases of this nature can be automated using information communication technology.

Suggested instructions for learning:
- Out of the data base management models below, focus your attention on the model assigned to your group.
    - Flat file model
    - Heirarchical model
    - Network model
    - Relational model
    - Object relational model
- Using the reading material on the model provided to you get ready to
    - Present difinitions
    - List characteristics

- Present examples
- Lead a small group discussion regarding the information you have obtained.
- Present your findings creatively and co-operatively to the whole class.

Reading Material

"Data" is a term familiar to all of us. The age of an individual, price of an article, number of students in a school etc; are data we encounter often. There is a collection of data we come across often in our day to day life, for example, date of birth, address, educational qualifications etc. But keeping a vast number of data in mind is a difficult task. Eg: Particulars of all the students in a school, prices of all the items in a shop etc. Therefore, a data base is used in order to facilitale these tasks and to store data systematically.

A data base is a collection of data maintained structurally. This can be managed by using traditional methods or the use of computer technology. But by using traditional methods, time, labour, physical space etc. are excessively used and in computerized management system these shortcomings are minimized and it could be done correctly.

There are several ways in the computerization method. They can be classfied as shown below.

Flat File Model

Here, while a data system is organized around a single file all the information in the data base are stored in a single table.

Item Code	Item Name	Unit Buying Price	Unit Selling Price	Quantity sales Within Month
011	Milk	130.00	140.00	1230 l
012	Cheese	125.00	130.00	2050 g
013	Butter	120.00	125.00	1260 g

Relational Model

A Relational Model is a collection of data with common sub-characteristics. These data are stored in several tables connected to each other. Here the repeated storage of the same data and information has been minimized.

Eg: Shown below is the relation between the tables in a data base maintained by a business organization.

Item Code	Item Name
011	Milk
012	Cheese
013	Butter

Item Code	Unit Buying Price	Unit Selling Price
011	130.00	140.00
012	125.00	130.00
013	120.00	125.00

Item Code	Quantity Sales Within Month
011	1230 l
012	2050 g
013	1260 g
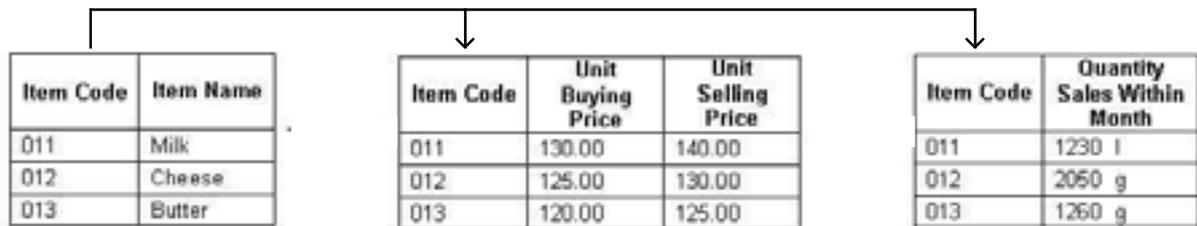
The Heirarchical Model and the Network Model can be presented as alternate models to the Relational Model.

Heirarchical Model

The Heirarchical Model is the model of a data base prepared according to the structure of a tree (heirarchical). In this structure data and information are connected to each other in the way children are connected to parents.   In the heirachical model data is kept in heirarchical format. Here the arrangement of data is in the form of an upside down tree. Here single table acts as the base and the other tables are acting as the branches. A relationship similar to the parent-child relationship exists here. That is, while a child has one parent, a parent can have several children.

```
                          ┌──────────┐
                          │   Base   │
                          └──────────┘
              ┌────────────┴────────────┐
        ┌───────────┐              ┌───────────┐
        │First Level│              │First Level│
        │  Child    │              │  Child    │
        └───────────┘              └───────────┘
        ┌─────┴─────┐              ┌─────┴─────┐
┌──────────────┐┌──────────────┐┌──────────────┐┌──────────────┐
│ Second Level ││ Second Level ││ Second Level ││ Second Level │
│   Child      ││   Child      ││   Child      ││   Child      │
└──────────────┘└──────────────┘└──────────────┘└──────────────┘
```
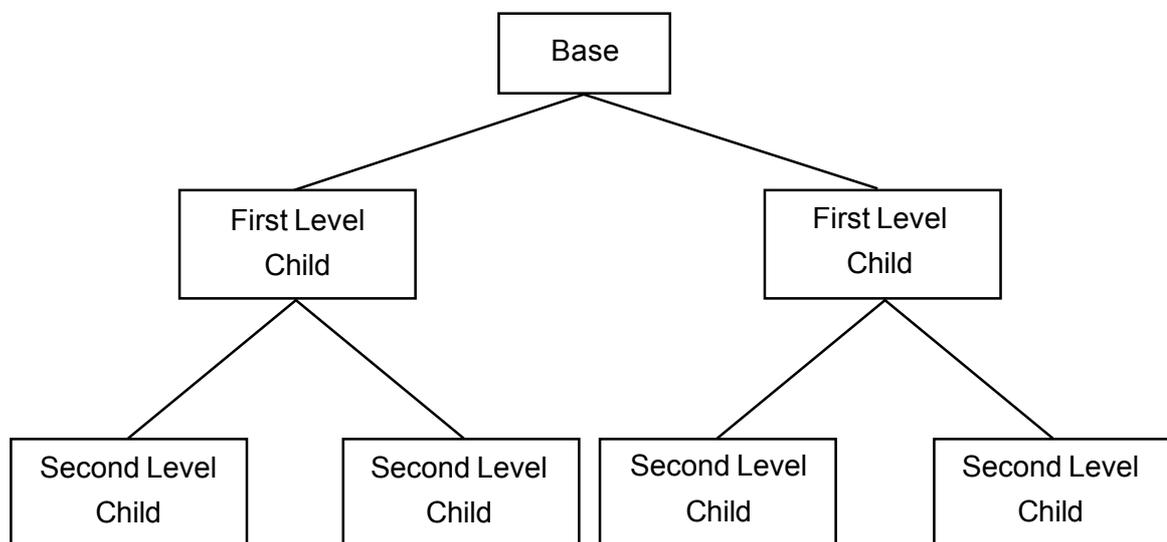
Here, in accessing lower level information it is necessary to move systematically downwards from the base table.

Network Model

The Network Model can be treated as a subset of the Heirarchical Model. Accordingly, it can be compared to the model of a tree with branches and twigs connected to each other. According to the parent child relationship above, a single child can have several parents.

```
                    ┌─────────┐
                    │  Store  │
                    └─────────┘
          ┌──────────┐       ┌───────────┐
          │  Clerks  │       │ Customers │
          └──────────┘       └───────────┘
                 ┌──────────────┐
                 │ Transactions │
                 └──────────────┘
                    ┌─────────┐
                    │  Items  │
                    └─────────┘
```
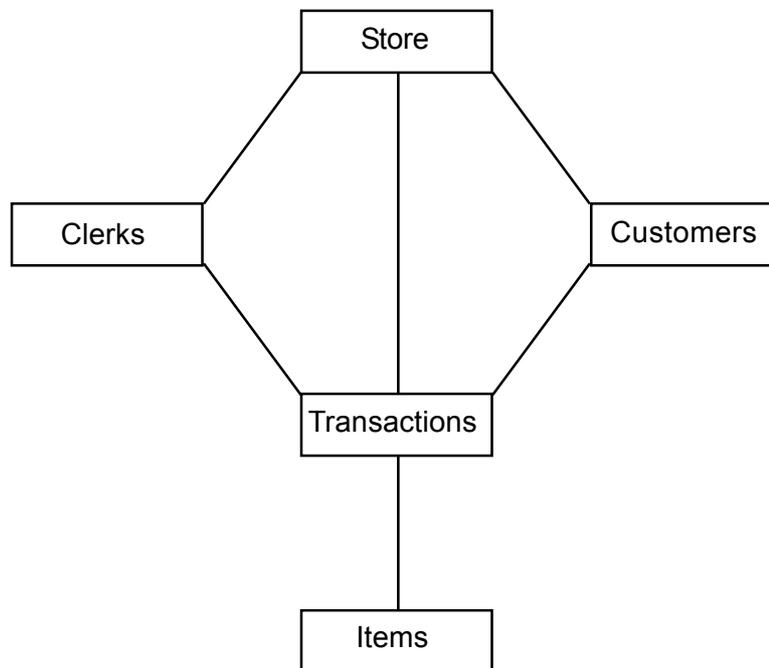
It is practically a difficult task to maintain and support such a system. A computer program is used quite often.

Object Relational Model

This too is quite similar to a normal relational model. It is also called the extended relations model. But here an object oriented language like Python, Java or Visual Basic is used for the purpose of data base management. This model was able to win over areas like Geographic Information Systems, Computer Aided Drawing and Multimedia Storage System which were not won over earlier.

Aids to understanding subject matter:
- Get the findings of small groups presented to the entire class.
- Provide the first opportunity for expansion, to the group that made the presentation.
- Get constructive suggestion of the other groups.
- Review, focussing on the following.
- In the management of data bases.
  - Using the traditional methods
  - Charactristics of computer related methods.
  - Also each model has similarities.
- The characteristics of each of these methods.
- The similarities and differences of each of these model.

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Competency 10:   Develops web sites incorporating multimedia technologies.

Competency Level 10.1: Explores different types of web pages available in the web to get acquainted with their content and structure.

Number of Periods: 05

Learning Outcomes:
- Defines World Wide Web (WWW)
- Name types of web sites and their necessities
- Surfs relevent web sites meaningfully and finds necessary information

Learning - Teaching Process:

Approach:
- Request a volunteer to describe how information is distributed.
- Conduct a discussion to highlight the following.
    - Several media are used to distribute information.
    - One of the media used to distribute information is printed newspaper.
    - The user has to navigate between pages to get information from the printed newspaper.
    - The user should access link pages to view further details of found information on the first page.
    - These link pages consist of text and pictures as well as various advertisements.
    - There are different types of newspapers and they vary according to content and structure.
    - Among them; newspapers carrying government information, newspapers of commercial nature sports tabloids and newspapers carrying personal information, are available and some news papers are formed according to readers tasks.
    - Internet can also be used to distribute information.
    - The design of websites and web pages in the internet is somewhat similar to that of a printed newspaper.

Suggested instructions for learning:
- Study the reading material carefully
- Out of the four websites given below pay greater attention to the type of web site assigned to your group.
    - International web sites
    - Transactional web sites
    - Community web sites
    - Entertainment web sites
- Identify www
- Surf the internet using the given email and web address.

- List out the charactaristics you identified in the reading material.
- Observe the characteristics other than what you noticed in the reading material.
- Identify the importance of the above instructions.
- Work within the given limit.
- Make a comparative study on the good and bad through your experience.
- Be prepared to make an innovative presentation on your findings to the whole session.

Reading Material

The World Wide Web (WWW) is a set of interlinked, hypertext documents accessed via the internet. It is a way of distributing information via computers connected to the internet. WWW was invented by Sir Tim Berners Lee who was working at Geneva, Switzerland.

A web site consists of one or more web pages. The user can access web pages using a web browser. Web pages contain text, images, videos and other web pages containing multimedia and one can navigate among them through hyperlinks.

Although web sites can be categorized as follows considering their content and structure into consideration, there is no such clear classification.

Types of web sites

Informational sites: This type of sites contains information on a specific subject or an organization. Informational sites are common. Although products are not sold directly in those sites there are banners and advertisements. Websites of government institution and educational institutions can be considered as type of web sites. These sites contain email addresses and telephone numbers.

Eg: www.nie.lk
   www.moe.gov.lk

Transactional sites: In this type, transaction is carried out between the customer and the company. E-commerce sites can be included in this category. The primary purpose of a transaction site is to market products and services.

Eg: www.amazon.com
   www.yahoo.com
   www.dsi.lk

Community sites: Community sites share the common interests of users and focus more on the interrelationships with the users. They provide both information and transactions.

Eg: http//acquarium.com
www.mextdaypets.com

Entertainment sites: Web sites designed for games and Entertainments are included in this type. They contain both the exchange of transactions and information.

Eg: http//disney.com
www.playraidsgames.com

Other type of web sites: There are Research and Artistic Web Sites. They include personal web spaces such as blogs. They do not provide much importance for transactions.

Eg: http//globalization-and-the environment.blogspot.com

In addition there are websites which act as a gateway to various sources of information and they are called web portals. They contain search engines and communication tools. Recently school libraries and other institutions have designed their own portals in keeping with the interests of teachers and students.

shopping portals
www.Amazon.com
www.ebay.com
www.barnesandnoble.com
www.schoolnet.lk

Government portal: www.gov.lk Web portals provide the relevant information within a short period. Sometimes they include market reports and telephone directories.

Aids to understanding subject matter:
- Assign task and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from the other groups.
- Lead a discussion so as to highlight the following.
  - That the www (world wide web) is a group of interconnected electronic documents saved in computers all over the world which could be accessed through internet.
  - That this is one means of distributing information between computers in the internet.
  - That web pages can be viewed through a web browser.
  - That hyperlinks can be used to surf among web pages.
  - That in a web page, there can be written text, still pictures, animations as well as audio and video.
  - That a web site is created through the collection of one or more web pages.

- That there are web sites of different types. They can be classified in terms of structure and content.
- That a web site providing information on a specific subject or organization is an information based site.
- That a web site created for money transactions or a similar tasks is a transaction related site. E-Commerce web sites belongs to this category.
- Web sites that give preference to the tastes of clients are community sites. These provide facilities for both information exchange and money exchange.
- That there are entertainment sites. They contain facilities for money exchange and information.
- That there are research and artistic web sites among other web sites. While they contain things like personal web facilities they do not give preference to matters regarding money.
- That apart from these there are web sites that function as a gateway to numerous sources through which information can be accessed.
- That these are called web portals.

Competency Level 10.2:   Analyses the structure and the composition of web sites to organize pages and content.

Number of Periods: 05

Learning Outcomes:

- Inquires into the content of a web page.
- Writes down the qualities of the building blocks of a web page.
- Enters the relevant web site and browses it meaningfully to access the necessary information.

Learning- Teaching Process

Approach:

- Give the opportunity to a volunteer to describe with, the help of the other students, how a page of a printed magazine has been organized.
- Conduct a discussion to highlight the following.
  - That a magazine has a table of contents and an abstract.
  - That page numbering is used to show the contents and the relation between the other pages.
  - That diagrams and pictures, descriptions, list of illustrations and table can be seen by turning the inner pages of the magazine.
  - That the inside of a page might be linked to another page.
  - That in writing text, topics are written in large letters or bold and that some letters can be in color.
  - That in the preparation of a magazine page attention has been paid to present material briefly, clearly, correctly, meaningfully and in a manner that they are connected to each other.
  - That the preparation of pages of magazine vary according to the type of book and content.
  - That new magazines contain the latest information.
  - That the manner in which a page in the internet web site and a page of a magazine are prepared is somewhat similar.

Suggested instructions for learning:

- Out of the four web sites below concentrate only on the web site assigned to your group.
  - www.harrypotter.warnerbros.com
  - www.iso.org
  - www.onsale.com
  - www.explainlanka.com
- Study the reading material well.
- Browse the home page assigned to your group and the other pages.
- Investigate whether there is a relationship between them.

- List out the qualities of the text, pictures and animations, in these pages.
- Investigate whether there are audio clips in these pages.
- Identify how their content has been arranged.
- In presenting information that the reading material contain, note other materials apart from the material considered.
- Confine yourself to the limits given.
- Get ready to present your findings innovatively and co-operatively to the whole class.

Reading Material

Home page
The first page seen when accessing a web site through a browser is the main page or the home page.

Link Pages
Other pages connected to the home page are called link pages. The building blocks of a web page are multimedia features like animations, audio and video etc.

The following points are taken into consideration when presenting information on a web page.
- Inclusion of necessary information only.
- In assembling adequate information that can be understood within a short period, tables, lists etc, are used.
- Presenting information in simple language using various models such that, it can be grasped by different people.
- Use of meaningful , clear , short and correct topics , short sentences and short paragraphs.
- Minimizing the number of search times and pages so that the user can search information efficiently.
- Grouping linked information together in organizing materials so that the user can understand them easily.
- That Information is new and impartial.
- Paying attention to aspects of letter size, shape and shade of letters in order to make the appearance of a web page attractive.
- Employment of suitable animations and stills.
- Use of frames in the preparation of a web page.
- Updating materials.
  It should be possible to manipulate a web site easily. Preparing pages of a web site varies in terms of its type and content.

Aids to understanding subject matter:

- Assign task and involve groups in exploration.
- Get the group findings presented to the whole class.
- Elicit constructive comments from other groups.
- Lead a discussion to highlight the following.
  - That the first page seen when accessing a web site through a browser is the main page or the home page.
  - That these are the main pages of a web site.
  - That the first page is linked to other pages. That these are linked pages.
  - That these pages are linked through hyperlinks.
  - That, not only text and stills, but animations and audio clips also can be included in a web page.
  - That the inside of a page is also linked to other locations.
  - That in the creation of web pages not only should the creator's aims be satisfied, the material should also be presented attractively and readably in a brief, correct and interconnected form or in a form that it would be a pleasure to listen to.
  - That in the organization of material attention should be paid to the structure of the format while lists and frames are also applied.
  - That in a web page, material is constantly updated.

Competency 11: Explores the system concept and uses Structured System Analysis and Design Methodology (SSADM) in developing Information Systems.

**Competency Level 11.1:** Explores Characteristics of systems

Number of Periods: 02

Learning Outcomes:
- Explains the need to create a system.
- Distinguishes between artificial systems and natural systems.
- Explains, with examples, that a system is built through the combination of other small systems.
- Uses concept maps to create complex concepts.
- Determines the structure of some thing based on the aims that need to be actualized.

Learning- Teaching Process

Approach:

Human Nervous System

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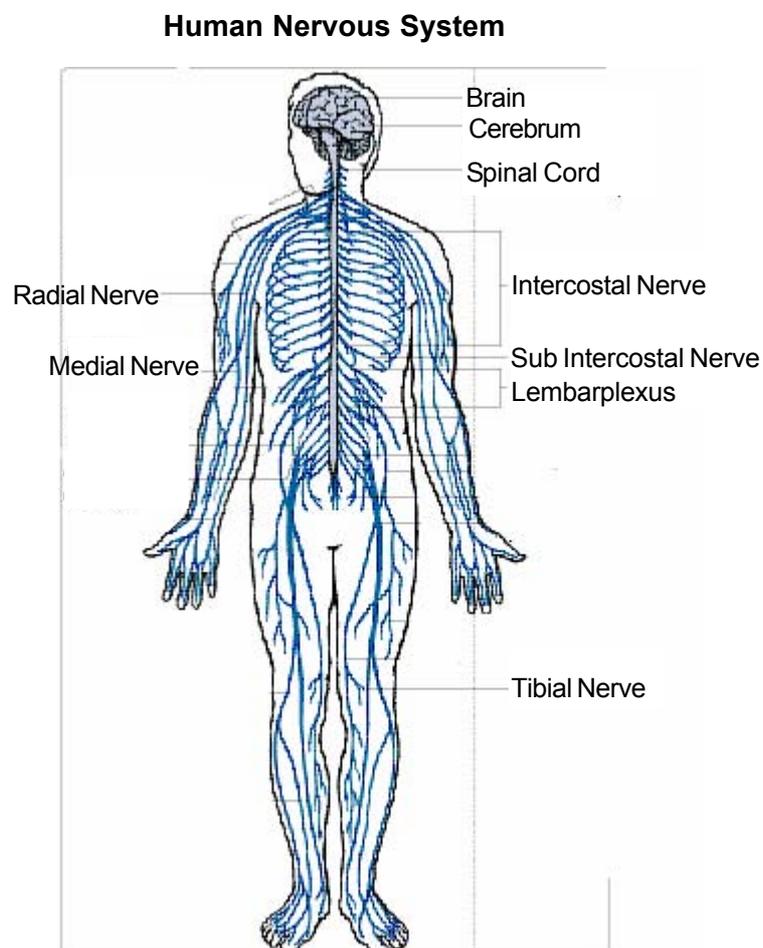
- Present the above diagram to the class.
- Give the opportunity to a volunteer to describe the task performed by the nervous system shown in this diagram.
- Get several students to name similar systems in the human body.
- Conduct a discussion to highlight the following.
    - That the human body is a collection of several systems.
    - That the similarly other systems are created by several parts that are linked and function cooperatively.
    - That while these parts have the ability to function as a system they are called sub systems of the original system.
    - That a particular system is created in order to satisfy a particular need / needs.

Suggested instructions for learning:
- Out of the four systems below pay attention to the system assigned to your group,
    - Telecommunication system
    - Computer system
    - Solar system
    - Echo system
- Study the system assigned to you well and explain its importance.
- Analyze once again the structure of the system.
- Identify the problems that arise when sub systems don't function properly.
- Note whether the system assigned to you is a natural system or an artificial system.
- If that system is a natural system, name an artificial one, if artificial, name a natural one.
- Identify sub systems under those systems also.
- Describe the characteristics of an information system accordingly.
- Suggest a plan for a classroom information system.
- Get ready to present your findings innovatively and co-operatively to the whole class.

Reading Material

A system is a group of interacting, interrelated, resources forming a common goal. In any system an input, a process and an output can be identified. A system can be classified as open and close, natural and artificial.

In the creation of any system, there should be a need for its production. For example, let us consider the need for the creation of the human nervous system. The human nervous system has been born in order to satisfy the need to carry the signals generated by each organ in the human body. The human nervous system satisfies the need to carry signals within the organism and its surroundings through the arrangement of a collection of specific cells as a network. That is, it has been naturally created so as to actualized a particular aim.

When the law of system is considered, the world can be shown as a complex system where several parts are interconnected. In defining the subject area of a system the idea in imposing a limit to it is to differentiate between the elements within the system and those outside it. Following this, the future behavior of that system can be predicted by creating a two dimensional model of a system that can be recognized easily.
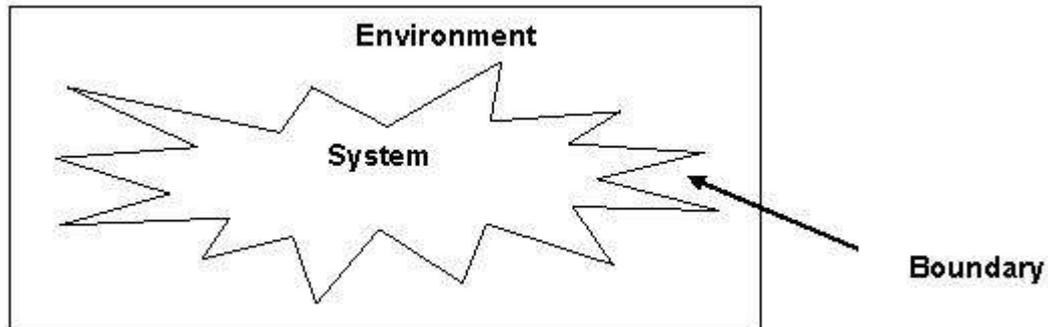
In the study of systems we can identify natural systems as well as those created by man. While the circulatory system , Endocrine system and environmental system are examples of natural systems, the computer system, legal system, and school system built by man are examples of man made systems. Natural systems can be separated as living systems and physical systems.

All systems are created through several interconnected, interacting parts. If the environment is taken as an example of a living system, it is a collection of all plants and trees, water, the sun, and organisms. The extinction of one of these entities will prove a factor creating a problematic situation to the functioning of the entire system. Electronic communication involves the combination of the transmitter, medium of transmission and the receiver. The failure of any one of these aspects will mean that the entire system will breakdown. Another point that should be emphasized here is that, while a system can be divided into several subsystems, that these sub systems also can function as systems.
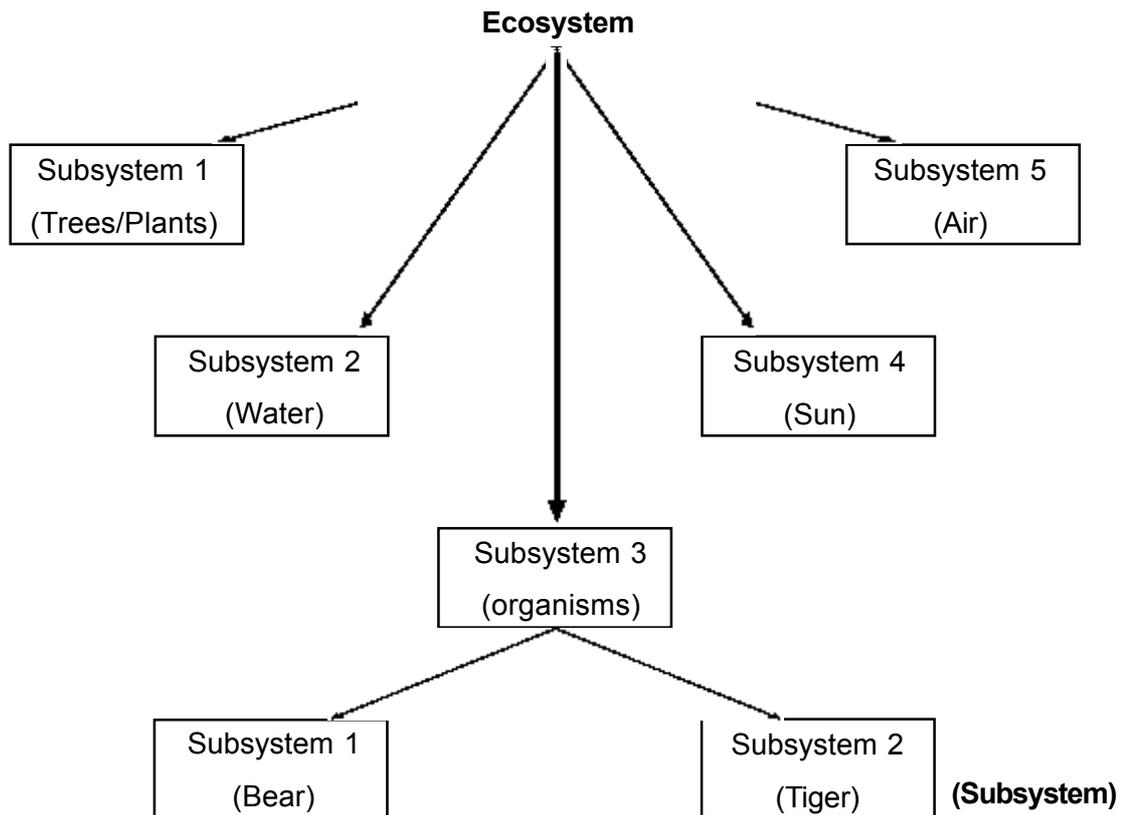
Ecosystem

```
        Ecosystem
    ┌──────┼──────────┐
    │      │          │
Subsystem 1│       Subsystem 5
(Trees/Plants)        (Air)

   Subsystem 2      Subsystem 4
    (Water)           (Sun)

            Subsystem 3
            (organisms)
          ┌──────┴──────┐
     Subsystem 1    Subsystem 2
       (Bear)         (Tiger)    (Subsystem)
```

Aids to understanding subject matter:

- Assign task and involve groups in exploration.
- Get the group finding presented to the whole class.
- Elicit constructive comments from other groups.
- Review, highlighting the following.
  - That the systems have been created naturally or artificially so as to actualize a particular aim.
  - That accordingly, the function of one system is different from the function of other systems.
  - That System can be classified as open and closed, natural and artificial.
  - That the natural systems can be classified further.
  - That in the creation of information system it is important to analyze them as follows.
  - Identification of sub systems.
  - Identification of the role of sub systems.

Competency Level 11.2: Compares and contrasts different types of manmade systems in terms of their objectives and functionality.

Number of Periods: 05

Learning Outcomes:
- Identifies systems of various types.
- Compares the aims involved in the creation of those systems.
- Classifies systems in terms of function.
- Analyses various types of systems used in day to day life in terms of their locations of application and functions.

Learning- Teaching Process

Approach:
- Divide the class into two groups and give the opportunity to one group to identify and present information systems found within the class room.
- Give the opportunity to the other group to describe the problems that arise in using the information systems identified.
- Give students who volunteer from both groups the opportunity of suggesting solutions for these problems.
- Conduct a discussion to highlight the following.
  - That computerized information systems have been created in order to resolve problems that arise in the use of manual information systems.
  - That automated systems have been created in order to implement computerized information systems without personal intervention.
  - That Information systems created by man using computer technology have always been created with some specific aim or the achievement of a particular need, in view.

Suggested instructions for learning:
- Out of the eight types of systems below, concentrate on the pair of systems assigned to your group, at random.
  - Automated Systems
  - Management Support Systems
  - Geographic Information Systems
  - Knowledge Management Systems
  - Content Management Systems
  - Enterprise Resource Planning Systems
  - Expert Systems
  - Embedded Systems

- Study the pair of systems assigned to your group, well.
- Identify the objectives with which these systems have been created, in terms of their roles.
- Should the system assigned to you not be those created based on computer technology, suggest alternative methods for the achievement of the tasks of these systems.
- Identify the problems that arise in the use of these alternative methods.
- Note what the data that you enter with respect to the systems provided to you, are.
- Note what the information you might get after those data have been processed by the system, are.
- Discuss the advantages and disadvantages of taking student attendence as a model of the classroom information system and computerization of that information.
- Identify the data you can provide to that information system and the information you can access from such data.
- Get ready to present your findings innovatively and co-operatively to the whole class.

Reading Material

Information Systems

An Information System is an interconnection of the components: humans, instructions and technology. These help in the tasks of collection or retrieval of information, processing, storage and distribution and contribute to the administration and decision making in daily life. An information system can be mainly divided into two parts. That is, information systems based on computer technology and information systems that are not based on computer technology. The Automated Teller Machine might be considered a system where computer technology is ingrained. Bio and physical systems can be considered as systems where computer technology is not ingrained.

Automated Systems

Although personal intervention is necessary for the operation of an information system, personal intervention is not required in the operation of an automated system. Very often, a computer is used in the operation of such a system.

The completely automated washing machine can be given as an example. Here, the amount of water provided to the machine, the number of turns and the amount of heat in the dryer etc, are all controlled by the micro chip installed in the machine.

Office Automation Systems

Office automation relates to the computer machinery and software used to digitally create, collect, store, manipulate, and relay institutional information needed for the performance of a particular basic task or the achievement of an objective. Former institutional automation systems performed the task of typing and photocopying. But today, they have advanced to the extent that the information in the system can be translated digitally and communicated as e-mail and voice mail.

Transaction Processing System

In IT a transaction is considered as a unit of activity which is exchanged in sequence in data bases or information systems during internal or external intractions. For example the task of depositing money, withdrawing and transferring funds from one account to another, in day to day banking transactions. The most important task performed through this system is that inefficiency and mistakes in the performance of the functions above are minimized.

Transaction processing is information processing that is divided into individual, indivisible operations, called *transactions.* Each transaction must succeed or fail as a complete unit; it cannot remain in an intermediate state.

This transaction processing is merely an information processing task that is divided into individual, indivisible operations, called transactions. Each transaction must succeed or fail as a complete unit; it cannot remain in an intermediate state. If this transaction stops at an intermediate state it will be a problem for the customer as well as for the bank.

For example, take a typical banking transaction in purchasing goods for, say, Rs. 500.00 from a supermarket and you pay through your credit card. The transaction that should take place is Rs.500.00 is debited from your account and Rs. 500.00 is credited to the account of the supermarket. In this transaction both the actions above take place simultaneously. If both these actions do not take place at the same time or only one action takes place, both the enterprise selling the article and you, will have to face difficulties. Therefore, Transaction Processing Systems have been built equipped with specific actions in order to perform these functions correctly. They are called ACID (Atomicity, Consistency, Isolation, and Durability)

Atomicity   :   Here, care is taken that a transaction is processed completely or that an incomplete transaction does not take place.

Consistency :   Here, the correctness of a transaction is confirmed. In the performance of transactions in small units, care is taken to protect the honesty of each such complete transaction.

Isolation   :   Even though transactions take place at the same time each transaction takes place either before or after a particular transaction. Care is taken to ensure that no two transactions take place simultaneously.

Durability :   Care is taken to ensure that once a transaction is completed satisfactorily, it is not subjected to breakdown.

Special features of a Transaction Processing System

Quick Response   :   Although speedy action is somewhat difficult to provide quick responses this special feature has been installed taking into consideration the importance of minimizing customer retention time.

Reliability	:	Mistakes are not anticipated in transactions made by customers, with the systems. Therefore, this, system is equipped with a broad security arrangement and a risk management unit.
Permanency	:	Every transaction is executed equally, irrespective of the status of individuals.
Controlled process	:	Is a process subjected to control, to assist in the tasks of the organization.

Management Information System

A management information system is a subset of the entire internal control process within a business. Human resources, documents and technical processors are covered by information management accountants. This is immensely useful in the solution of business problems Eg, Finding the turnover in production or services and finding broad business strategies are the tasks performed.

Decision Support Systems

Is an Information system of a specific type. These help in decision making within a particular business or organization.

Executive Support Systems

An Executive Support System is a tool that provides facilities for the productive summarization of data of a particular organization. These reports are obtained generally by managers of executive level for purposes of quick review.

Geographical Information Systems

These help control and present data accessed, stored or analyzed with respect to a particular geographical location. According to technology this system contains mapping software, remote sensing, land surveying, arial photography, mathematics, photogrammetry and geography

Knowledge Management Systems

These perform the function of identifying the activities of different ranges use within an institution, creation, production, distribution and the application of their philosophies and practices for various needs. While these philosophies and practices can be incorporated within a single individual or the activities of an institution, they help acquire knowledge.

Content Management Systems

These are mostly used in the storage of documentation, control, preparation of versions and publication for industry. These documents include News, Constitutions, Manuals procedures, Technical Manuals, Catalogues, Booklets etc. There exist another system similar to this that is the document management system.

Enterprise Resource Planning Systems

This is a broad institutional system that helps control and coordinate all resources of an enterprise through a shared database.

Expert Systems

While an expert system is software it attempts to copy the performance of an expert or experts in a particular field, it also tries to demonstrate that expert's achievement. Artificial intelligent is employed for this purpose. Various types of methods are applied in the demonstration of the performance of these experts.

Embedded Systems

This is a system committed for a single or minute specific tasks. This is a system that is embedded as part of a complete piece of equipment.

Aids to understanding subject matter:
- Assign task and involve groups in exploration.
- Get the group finding presented to the whole class.
- Elicit constructive comments from the other groups.
- Lead a discussion to highlight the following.
    - That there are Information systems inclusive of computer technology and that there are Information Systems where computer technology is not included.
    - That collection of information, processing, storing, analysis and distribution are carried out by any Information System.
    - That there are input data and output information in any Information system.
    - That information important in taking decisions in terms of the standing of each individual, can be provided through the information systems that contained computer technology correctly and in time and also in the quantity required by that individual.
    - That in considering the creation of modern information systems, use of the computer has been made of the ability of the computer to take decisions.
    - That we should appreciate the creation of systems by ourselves to meet our aims and needs.

Competency 12: Explores how Information and Communication Technology can be applied in Competitive Market and Business institutions.

Competency Level 12.2: Analyses the relationship between Information and Communication Technology and Business operations.

Number of Periods: 05

Learning Outcomes:
- Introduces and explains the concepts of Electronic Business and Electronic Commerce.
- Names the types Electronic Business transactions.
- Represents information in brief using tables.

Learning - Teaching Process:

Approach:
- Taking into consideration the need to purchase a small computer, focus attention on the web site of an electronic market like www.ebay.com that provides consumer services.
- Lead a discussion highlighting the following:
  - That purchases, sales and services are provided by an electronic market.
  - That the web sites studied are types of electronic commercial transactions that provide services from consumer to consumer.
  - That, while, apart from this, there are other electronic business transactions, there are also the electronic business processes like an electronic market.

Suggested instructions for learning:
- Out of the sets of web sites below, pay attention to the set of web sites assigned to your group.
  - www.walmart.com
  - www.paypal.com
  - www.dell.com
- Study the reading material well.
- Identify electronic commerce and electronic business.
- Pay intense attention as to what type of electronic business transaction the set of web site you have been assigned, belongs.
- Give in brief, the information on the section relevant to you, from the table below.

	B	C	G
B			
C			
G			

- From the electronic business processes in the reading handout list the qualities of the processes to which your web site belongs.
- Inquire into the advantages and disadvantages of electronic business.
- Work within the limits given.
- Get ready to present you group findings creatively and collectively to the entire class.

Reading Material

Electronic Business - Purchase, sale and provision of services through the internet is called electronic business.

Electronic Commerce - While this is part of electronic business, business transactions are carried out through the internet. That is, it is a process of exchange between institutions, individuals, between parties and their institutions or within parties.

Types of Electronic Business; money transactions
B2B - Business to Business

Purchase and sale between two companies is called B2B. Here, dissemination of confidential information and access to same is limited. They contain only selected information. They are transported free of charge. Payment facilities have been provided to members in order to execute transactions.

While they contain electronic equipment, food, furniture, pharmaceuticals, toys and creative games, prices are also displayed.

B2B Requirements - Dissemination of prices and the description of goods should be on the basis of mutual agreement between the vendor and the purchaser. Institution system should communicate without having human relationships between customers.

Eg: http/www.walmart.com

B2C - Business to Consumer

This is a business transaction where products and services are sold through the internet for the convenience of consumers.

Electronic Commerce - Sharing of electronic commercial income is carried out through this. Here, no mutual agreement is necessary regarding prices and description of goods. Business relations are not necessary between other systems.

www.auction.com
www.amazon.com
www.dell.com

C2C - Consumer to Consumer

The sale of goods by one consumer to another consumer across the internet is called C2C.

Sometimes it is possible to get registered. Goods purchased are sent, by post, free of charge, Books, antiques, stamps, video games, phones etc. can be sold.

Eg: www.ebay.com
   www.paypal.com
   www.qxl.com

C2B - Consumer to Businessman

While the consumer acts as the seller and the business as the buyer, the consumer is made a payment for the services provided.

Eg: www.priceline.com
   www.accompany.com

B2E - Business to Employee

Supply of the goods and services of a company to their employees is called B2E.

This is a common task related to the employees. Here, employees have one web address within the institution. B2E money transactions are arranged to suit the needs of the employees.

G2C - Government of Consumer

Here a service is provided by the government to the consumer. While the government saves money, it provides very important information and service to the public.

Eg: online license renewal taxes etc

Process of Electronic Business

Here direct sale of goods through virtual storefront internet takes place. While there is an electronic directory and catalogues, it is opened 24 hours.

Eg: www.amason.com
   www.compudata.com
   www.CDNow.com

Information Brokers

While this can be an enterprise or an individual it finds common data and bank information for its service providers. It saves money and time for service providers. Collects online data.

Sells on commission. Their advertisements are disseminated. Can become a subscriber. Can become B2B or B2C.

Eg: Mardet research
Patent reaearch
Online market

Eg: www.ebay.com
www.caretotrade.com
www.greekvillage.com

Content Provider

Various kinds of electronic information is provided through this. Among these are frequently renewed information like news, statements, e-post, pictorials, letters and animations.

Eg: www.yahoo.com
www.aol.com
www.wikipedea.org

Online service provider

The consumer is provided online service through this.

Eg: www.wow.lk
www.wikipedea.org

Portals

The anchor can view sites linked to this, portals have been created about government institutions, by the government and by universities about education, university education by universities for the use of students.

Eg: www.lllde.vit.edu
www.wsu.edu   -   Washington state University
www.myharverd.edu -   Harvard University
www.myasu.edu   -   Arizona University
www.myyahoo.com   -   A commercial portal
www.gov.lk   -   Sri Lanka Internet exit

Virtual Communities

Communities that are not visible to the user are called by this name. Here, news, telephone conversations, news letters are communicated to a mass of individuals through electronic post. The virtual community is used for the purpose of meeting people, exchange of stories,

working together, politics. environment, exchange of information regarding diseases etc. There are Chat Boxes, News Bulletins in these.

Eg: yahoo groups, google groups

Advantages and disadvantages of e-businesses
The service of electronic business between the accessor and the provider depends on trust.

Advantages : Provision of support, operation and guidance after sales of goods
Selection of attarctive items
Competitive pricing
Assurance of satisfaction
Speedy service
Easily accessible pages
Quick purchase and distribution
Advertisements
Awards, commissions, special awards
Provision of personal attention to consumer
Chat boxes, e-societies, social interrelations of news groups

Disadvantages : Absence of confidence in items ordered
Absence of confidence on information regarding items ordered
Absence of connections between marketing companies
Reliability of credit notes becoming a problem in cash settlements
Insecurity regarding balance cash
Lack of security of goods sent

Aids to understanding subject matter:
- Get the findings of small groups presented to the whole class.
- Give the group making the presentation the first opportunity of elaboration.
- Get the constructive suggestions of the other groups.
- Review with focus on the material below.
  - That in electronic commerce, sale of goods, purchase and povision of services take place through the internet.
  - That e-commerce is considered a sub section of an e-business.
  - That transactions in e-business can be classified as "from a business to a business, business to consumer, consumers to consumers, business to employees and a government to consumers."
  - That direct sale of goods in business, functioning as information brokers and the supply of contents etc. in letters, tables, take place through the internet.

- That, similarly, provision of electronic services, provision of connections to other websites and working together with them, takes place.
- That tasks like setting up of companies for purposes of socialization also takes place.
- That there are advantages as well as disadvantages in electronic business.

Introduction- School Based Assessment

Learning –Teaching and Evaluation are three major components of the process of Education. It is a fact that teachers should know that evaluation is used to assess the progress of learning –teaching process. Moreover, teachers should know that these components influence mutually and develop each other .According to formative assessment (continuous assessment) fundamentals; it should be done while teaching or it is an ongoing process. Formative assessment can be done at the beginning, in the middle, at the end and at any instance of the learning teaching process.

Teachers who expect to assess the progress of learning of the students should use an organized plan. School based assessment (SBA) process is not a mere examination method or a testing method. This programme is known as the method of intervening to develop learning in students and teaching of teachers. Furthermore, this process can be used to maximize the student's capacities by identifying their strengths and weaknesses closely.

When implementing SBA programmes, students are directed to exploratory process through Learning Teaching activities and it is expected that teachers should be with the students facilitating, directing and observing the task they are engaged in.

At this juncture students should be assessed continuously and the teacher should confirm whether the skills of the students get developed up to expected level by assessing continuously. Learning teaching process should not only provide proper experiences to the students but also check whether the students have acquired them properly. For this, to happen proper guiding should be given.

Teachers who are engaged in evaluation (assessment) would be able to supply guidance in two ways. They are commonly known as feed-back and feed- forward. Teacher's role should be providing Feedback to avoid learning difficulties when the students' weaknesses and inabilities are revealed and provide feed-forward when the abilities and the strengths are identified, to develop such strong skills of the students.

Student should be able to identify what objectives have achieved to which level, leads to Success of the Learning Teaching process. Teachers are expected to judge the competency levels students have reached through evaluation and they should communicate information about student progress to parents and other relevant sectors. The best method that can be used to assess is the SBA that provides the opportunity to assess student continuously.

Teachers who have got the above objective in mind will use effective learning, Teaching, evaluation methods to make the Teaching process and learning process effective. Following are the types of evaluation tools student and, teachers can use. These types were introduced to teachers by

the Department of Examination and National Institute of Education with the new reforms. Therefore, we expect that the teachers in the system know about them well.

Types of assessment tools:

1.	Assignments	2.	Projects
3.	Survey	4.	Exploration
5.	Observation	6.	Exhibitions
7.	Field trips	8.	Short written
9.	Structured essays	10.	Open book test
11.	Creative activities	12.	Listening Tests
13.	Practical work	14.	Speech
15.	Self creation	16	Group work
17.	Concept maps	18.	Double entry journal
19.	Wall papers	20.	Quizzes
21.	Question and answer book	22.	Debates
23.	Panel discussions	24.	Seminars
25.	Impromptus speeches	26.	Role-plays

Teachers are not expected to use above mentioned activities for all the units and for all the subjects. Teachers should be able to pick and choose the suitable type for the relevant units and for the relevant subjects to assess the progress of the students appropriately. The types of assessment tools are mentioned in Teacher's Instructional Manuals.

If the teachers try to avoid administering the relevant assessment tools in their classes there will be lapses in exhibiting the growth of academic abilities, affective factors and psycho- motor skills in the students

Learning - Teaching Evaluation Instruments

(1) Stages of evaluation : 1st Term, Evaluation stage I

(2) Competency level covered : 1.1, 1.2, 1.3, 1.4

(3) Subject content relevant to the instrument :
- Data, Information and knowledge
- The decline that takes place when data and information used in the traditional method dissemination in mega scale
- Dawn of the age of Information Technology and the combination of technology and communication technology
- Issues created from information and communication technology
- Time value of information

(4) Nature of the instrument :
- Classroom Newspapers

(5) Aims of the instrument :
- Improves creative writing ability.
- Improves knowledge of other topics by reading newspapers just as much as exploring information regarding information relevant to the topic to be written on
- Studies how basic concepts of information and communication technology are employed in present-day society

(6) Instructions for teachers to be implemented :
- Inform students at the end of competency level 11.1 that they have to prepare a class-room newspaper at the end of competency level 1.4
- Educate students on evaluation criteria
- Divide class into five groups and assign each of the topics below to each group
  - Data, Information and knowledge
  - The usefulness of information and communication technology in avoiding discrepancies occurring when data and information are disseminated according to the traditional methods

- Dawn of the age of information technology and the combination of information technology and communication technology.
- Issues created by information and communication technology.
- Contemporary importance of information and the influence of information and communication technology on other technologies.
- Inform them that every student has to write newspaper article, based on knowledge gained from point or electronic media, on the topic assigned to his/her group.
- Fix a date for student creations to be handed over.
- Inform students that all the creations provided to the respective group after revision should be studied by each member of the group and present it as a single creation.
- Fix a date for all the group creations to be handed over.
- Assign marks for creations at each relevant stage.

Instructions for students to be implemented	:	• Follow the teacher's instructions.

- Follow the teacher's instructions.
- Obtain information for the relevant creations from newspapers, periodicles, internet etc.
- Ensure that the relevant creations are handed over on the fixed date.
- Consider that every member of the group should collect information relevant to the topic.
- Take care to see that you hand over your independant creation to the teacher by the date fixed for the purpose.
- Prepare a single report, taking all the independent creations into consideration on a date fixed by the teacher.
- Hand over these creation to the newspaper on the relevant date.

(7) Criteria for assignment of marks :
- Inclusion of information relevant to the topic.
- Punctuality in performing task.

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- Inclusion of not only subject matter but also new information.
- Conformity to the teacher's instructions.
- Creative presentation.

Range of marks :
- Very good - 04
- Good - 03
- Medium - 02
- Needs development - 01

Learning - Teaching Evaluation Instruments

(1) Stages of evaluation : 1st Term, Evaluation stage II

(2) Competency level covered : 3.1, 3.2, 3.4, 4.1, 4.2, 4.3

(3) Subject content relevant to the instrument :
- Representation of decimals with and without signs.
- Translation between number systems used in the computer.
- Binary coded decimals, extended binary coded decimal transfer, standard American code for infomation exchange, unitary code.
- Numbered logical gates.
- Two-state logic operations.
- Postulates
- Laws/Theorems
- Standard logical expression
- Use of logical expressions

(4) Nature of the instrument :
- Crossword puzzle

(5) Aims of the instrument :
- Acquires proficiency regarding sinhala computer applications.
- Pursues new sources to search for information.
- Exhibits co-operativeness in the creation of a single puzzle.
- Improves logical thinking ability.
- Improves ability to solve problems logically.

(6) Instructions for teachers to be implemented :
- Inform students at the commoncement of competency level 3.1 that the creation and solution of a cross word puzzle takes place at the end of competency level 4.3
- Inform students about evaluation criteria
- Divide class into three and provide each group a topic below.
  - How numerical data are represented in a computer and how characters, numerals and symbols are represented in a computer.
  - Basic logic gates and their characteristic functions.

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- Boolean algebraic laws and the karnaugh map.
- Emphasize that one puzzle should include at least 20 words and that each student should contribute 5 words, necessarily.
- Examine the crossword puzzle words created by the students, on the assigned date and give instructions for necessary revisions.
- Inform students to present the words pro vided once again after the revision, in a single puzzle.
- Fix a date for the submission of the final results of all the groups.

Instructions for students to be implemented	:	• Follow the teacher's instructions. • Every participant should be responsible for the preparation of the required number of puzzle terms. • One should be responsible that the relevant terms are created by ones own self. • Forward the relevant terms and puzzles to the teacher on the assigned date and make the requred adjustments. • Prepare puzzles co-operatively and creatively with the participation of everybody. • Get ready to present the puzzle to the class on the date specified by the teacher.
(7) Criteria for assignment of marks	:	• Presentation of questions and answers creatively. • Correctness • Evidence of co-operation • Punctuality in handing over relevant statements and final puzzle. • Manipulation of terms to match given expect answers.
Range of marks	:	• Very good - 04 • Good - 03 • Medium - 02 • Needs development - 01

Learning - Teaching Evaluation Instruments

(1) Stages of evaluation : 1st Term, Evaluation stage III

(2) Competency level covered : 7.1, 7.2, 7.3, 11.1, 11.2

(3) Subject content relevant to the :
    instrument
- Concept of systems
- Information systems
- Automated systems
- Definition of problems and their limits
- Examination of solutions
- Identification of problem
- Planning of solution
- Algorithms
- Flowcharts
- Pseudocodes

(4) Nature of the instrument :
- Practical activities

(5) Aims of the instrument :
- Acquires practical knowledge of the process that takes place within an Information System.
- Writing the process taking place in a system as an Algorithem.
- Acquires deep knowledge regarding preparation of a flowchart according to an alogrithem.
- Converts the flow chart to pseudo code

(6) Instructions for teachers :
    to be implemented
- Inform the students at the commencement of competency level 7.1 that they have to do activities at the end of competency level 11.2.
- Subject matter relevant to competency levels 7.1, 7.2, 7.3, 11.1 and 11.2 are included for practical activities.
- Educate students on creation of assessments.
- Divide class into 3 groups and prepare them to go to the locations below and observe their activities
  - School canteen
  - School library
  - School office
  - Inform them that they should observe the activities there, very well.

- Inform them that after this all three groups should build an algorithm each.
  - Once again divide the 3 groups to two sub groups.
- Inform the sub-groups to get ready to present their creations under the topics below.
  - Flowcharts
  - Pseudocodes
- Inform them tht every student should make a study of the topic assigned to his/her group based on ones previous knowledge.
- First of all assign a day, in advance, to display the alogrithm. Examine the relevant creations and give instructions regarding adjustments.
- Following this, assign a date for the inspection of the creations developed on the flow chart and pseudo code.
- On the day assigned, examine the relevant creations and give instructions regarding revisions.
- Inform the groups that the final creations will be prepared with participation of each group and sub-group, on the assigned date.
- Award marks in terms of criteria relevant to each stage.

| Instructions for students to be implemented | : | • Study well the functions of the location assigned to your group, under the instructions of your teacher. |

- Be prepared to present the alogrithm built on the functions of the location, on the dates as signed by your teacher, as well as the creations of your sub-groups.
- Show same to your teacher on the date assigned and get instructions on required revision adjustments.
- Remember that every member of the group should take part in the implementation of the assignment.
- Should be taken to hand over creations to your teacher on the date fixed for the purpose.

(7) Criteria for assignment of marks	:	•	Correct identification of the activities in the relevant location.
		•	Posing of points correctly.
		•	Concern for punctnality in performance.
		•	Conformity to teachers instructions.
		•	Correctness of final creation (product)

Range of marks	:	•	Very good	- 04
		•	Good	- 03
		•	Medium	- 02
		•	Needs development	- 01