FIRST TERM 2024/2025 SESSION

COMPUTER NOTE FOR SS3

SCHEME OF WORK

Lesson One: Network Devices

Lesson Two: World Wide Web

Lesson Three: Software for Web Development

Lesson Four: Cables and Connectors

Lesson Five: Computer Cables and Connectors

Lesson Six: Security and Ethics

Lesson Seven: Graphics Packages

Lesson Eight: High Level Languages

Lesson Nine: Overview of number bases

Lesson Ten: Data Representation

LESSON ONE
NETWORK DEVICES

Network devices are those set of equipment that enable data transfer, communication and generally enhance the network flow, organization and functionality.
Network devices are also defined as components used to connect computers or other electronic devices together so that they can share files or resources like printers or fax machines.
The common network devices are:

(i) Hubs
(ii) Gateway
(iii) Concentrator
(iv) Modems
(v) Bridges
(vi) Wireless access point
(vii) Switches
(viii) Repeater
(ix) Media converter
(x) Routers
(xi) Multiplexer
(xii) ISDN terminal adapter
(xiii) Network Interface Card (NIC)

***HUB*:** A hub is a device that connects a number of computers together to make a LAN (Local Area Network).This is small rectangular box, often made of plastic that receives its power from an ordinary wall outlet. It has multiple input/output (I/O) ports, in which a signal introduced at the input of any port appears at the output of every port. Hub is a device for connecting multiple Ethernet devices together and making them act as a single network segment.


MODEM: This is a short for Modulator-DEModulator. This device is constructed from Modulate and Demodulate. It is a device that modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode that transmitted information. The goal is to produce a signal that can be transmitted easily and decoded to produce the original digital data.

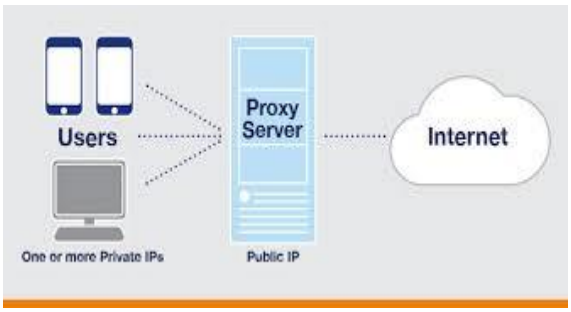

SWITCHES: A switch is like a hub, is a device that connects a number of computers to make a LAN. This is a device that provides a central connection point for cables from workstations, servers and peripherals. A switch is a telecommunication device which receives a message from any devices a message from any device connected to it and then transmits the message only to that device for which the message was meant for.

***ROUTERS*:** This is a network device that connects together two or more networks. A common use of a router is to join a home or business network (LAN) to the internet (WAN). Basically, routers link different networks together.

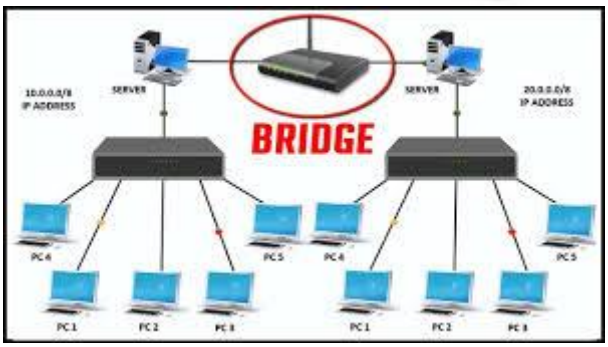

***NETWORK INTERFACE CARD (NIC)*:** Any computer that is to be connected to a network needs to have a network interface card (NIC). Most modern computers have these devices built into the motherboard, but in some computers you have to add an extra expansion card. Some

computers , such as laptops, have two NICs: one for wired connections, and one for wireless connections (which uses radio signals instead of wires).

***PROXY SERVER*:** This is a computer setup to share a resource, usually an internet connection. Other computers can request a web page via the proxy server. The proxy server will then get the page using its internet connection, and pass it back to the computer who asked for it. Proxy servers are often used instead of router since additional software can be easily installed on the computer such as antivirus, web filtering etc.



BRIDGE: This is a network device that typically links two or more LANs together. Whereas a router is usually used to link a LAN and WAN (such as internet), a bridge links independent parts of a LAN or several LANs so that they acts as a single LAN.



Benefits of Networking

1. It is very useful in sharing resources such as hardware and software. e.g. Printers, operating system, DVD Drives etc
2. It eases communication

3. It eases collaboration
4. It aids remote database access
5. It improves effective customer service
6. it helps to overcome undue stoppage of work due to breakdowns because a network can have multiple file servers, mail servers and network printers
7. It improves security and prevents system crashes and deletion of files.

Tutorial Questions

1. Briefly explain the following network devices:
   (i) Hub
   (ii) Switch
2. State one difference between star and bus topologies
3. List four common network devices
4. Define Network topology
5. identify any four network topology
6. State one difference between the following.
   (i) Web server and web browser
   (ii) Hub and switch

LESSON TWO

WORLD WIDE WEB (WWW)

World Wide Web is a system of interlinked hypertext documents accessed via the internet. More so, it is a service that operates over the internet and not the internet itself as wrongly conceived. However, with a web browser, one can view web pages that may contain text, images, videos, and other multimedia and navigate between them via hyperlinks.
The World Wide Web uses three protocols namely:

i. HyperText Markup Language (HTML)
ii. HyperText Transfer Protocol (HTTP)
iii. Uniform Resource Location /Locator (URL)

History of World Wide Web

Distinct from the Internet, the World Wide Web refers to hypermedia using Hypertext Markup Language or HTML. This unique language allows information to be linked so when a person selects or clicks on one part of a link their browser automatically finds the designated information. Thus, the Web's unique characteristic is that it empowers the user to "click" on a word and be transported to a related web location. The development of this innovation is attributed to Tim Berners-Lee, a researcher at the CERN Institute of Geneva, Switzerland who is credited for the creation of the first links on the World Wide Web. In 1992 the University of Illinois introduced the first web browser, an online search tool that "surfs" all of the information on the Web, locates matches, and then ranks results.
The web became more than just an interesting experiment in 1993 with the development of a graphical browser. Up until this point, even the World Wide Web was terminal-based, meaning that the user depended on the use of a keyboard. Marc Andreesen, who was working with a team at the National Center for Supercomputing Applications (NCSA) created the first graphical browser, one that was not terminal based, called Mosaic.
Andreesen and a few team members left NCSA in 1994 to commercialize the graphical browser and form the company Netscape Communications. Netscape's formation marks the onset of the commercialization of the World Wide Web. In 1995, the National Science Foundation gave up the exclusive control of the Internet backbone of routers and high-speed lines, allowing the development of commercial. Soon after, Microsoft also tried to capture a large portion of the Internet browsers market with Internet Explorer.

By 1995, an estimated 50 million users were connected to the Internet worldwide. With the telecommunications act of 1996, the E-rate program came into existence with the goal of connecting millions of schools. Net-coalition was founded in 1999 to set standards for e-commerce, which was already blossoming. The business and media worlds were rocked in 2000 when Time- Warner and AOL announced their merger, making the marriage of the media industry and cyber space a reality.

In 1994, during a strong period of innovation, the first cyber-age robbery occurred in Russia. The theft of millions of dollars from Citibank showed the world the ramifications of the misuse of this new technology. It did not take long for the world to realize that crimes could be perpetrated on the such as money- making scams and computer hacking.

Basic Terminologies of WWW

a) Agent : Agents are search tools that automatically seek out relevant online information based on your specifications. Agent A.K.A.s include: intelligent agent, personal agents, knowbots or droids.
b) Annotations: Personal notes you can attach to the documents you have saved in Mosaic. The notes are available to you whenever the document is viewed.
c) Archie: Derived from the word archive, Archie is a Net-based service that allows you to locate files that can be downloaded via FTP.
d) ASCII :(pronounced "Ask-ee") An acronym for American Standard Code for Information Exchange, ASCII is an international standard in which numbers, letters, punctuation marks, symbols and control codes are assigned numbers from 0 to 27. Easily transferred over networks, ASCII is a plain, unadorned text without style or font specifications.
e) Avatar: This term refers to an interactive representation of a human in a virtual reality environment.
f) Browser: A type of software that allows you to navigate information databases.
g) Client: A computer that has access to services over a computer network. The computer providing the services is a server. Client-Server Architecture: An information-passing scheme that works as follows: a client program, such as Mosaic, sends a request to a server. The server takes the request, disconnects from the client and processes the request. When the request is processed, the server reconnects to the client program and the information is transferred to the client. This architecture differs from traditional Internet databases where the client connects to the server and runs the program from the remote site.
h) Cyberspace: A term coined by William Gibson, a science fiction writer, to refer to a near-future computer network where users mentally travel through matrices of data. The term is now used to describe the Internet and the other computer networks.
i) Dial-up Connection: The most popular form of Net connection for the home user, this is a connection from your computer to a host computer over standard telephone lines.
j) Firewall: This term refers to security measures designed to protect a networked system from unauthorized or unwelcome access.
k) FTP: File Transfer Protocol is a protocol that allows the transfer of files from one computer to another. FTP is also the verb used to describe the act of transferring files from one computer to another.
l) Gopher: A menu-oriented tool used to locate online resources.
m) GUI: An acronym for Graphical User Interface, this term refers to a software front-end meant to provide an attractive and easy to use interface between a computer user and application. Macintosh operating system is pretty GUI, DOS is not.
n) Home Page: The document displayed when you first open Mosaic. Home Page also refers to the first document you come to at a Web site. A home Page is the main or index page of a web site. For example, if a user opens Netscape or Internet Explorer and types the URL, http://www.commentum.com, that would open the home Page of the Commentum Communications company
o) Host: A computer acting as an information or communications server.

p) HTML: An acronym for HyperText Markup Language, HTML is the language used to tag various parts of a Web document so browsing software will know how to display that document's links, text, graphics and attached media.
q) HTTP: The abbreviation for Hypertext Transfer Protocol, HTTP is used to link and transfer hypertext documents.
r) Hypermedia: The hypertext concept extended to include linked multiple media.
s) Hypertext: This term describes the system that allows documents to be cross- linked in such a way that the reader can explore related documents by clicking on a highlighted word or symbol.
t) IP: The abbreviation for Internet Protocol, IP refers to the set of communication standards that control communications activity on the Internet. An IP address is the number assigned to any Internet-connected computer.
u) MPEG: The acronym for Moving Pictures Expert Group, MPEG is an international standard for video compression and desktop movie presentation. A special viewing application is needed to run MPEG files on your computer.
v) NIC: The abbreviation for Network Information Center, NIC is an organization responsible for supplying information for component networks that comprise the Internet.
w) Node: A device attached to a network. A node uses the network as a means of communication and has an address on the network.
x) Protocol: A set of standards that define how traffic and communications are handled by a computer or network routers.
y) Server : A computer system that manages and delivers information for client computers. A server is a computer with a software program set up for serving web pages to a user on the same computer or another computer. The server computer coupled with server software, listens for inquiries from a client computer (a computer other than the server).
z) URL: This is the abbreviation for Uniform Resource Locator, The addressing system used in the World Wide Web and other Internet resources. The URL contains information about the method of access, the server to be accessed and the path of any file to be accessed. Uniform Resource Locator is a web address used to connect to a remote resource on the world wide web.
For example:
https://www.comentum.com
ftp://ftp.comentum.com
telnet://info.comentum.com
In the above example, http:// is a type of Protocol (communication rules and methods) followed by www.commentum.com, which a host address. A port number could also be added after the host address (example: https://www.comentum.com:80).
aa) Web Browser: This is the software that allows a user to access and view HTML documents. Examples of Web browsers include Mosaic, Cello and Lynx.
bb) Web Page: An HTML document that is accessible on the Web.
cc) Webspace: This term refers to the space created by the World Wide Web.
dd) World Wide Web: Also known as WWW or W3, the World Wide Web is a hypertext-based Internet service used for browsing Internet resources

Uses / Benefits of World Wide Web (WWW)

1. Online Presence 24/7: Having a website means customers are always able to find you – anytime, anywhere. Even outside of business hours, your website continues to find and secure new customers. It offers the user convenience as they can access the information they need in the comfort of their own home, with no added pressure to buy. Plus, as most companies nowadays have their own website, there's every chance you could be losing customers to your competitors by staying offline.
2. Information Exchange: At its simplest, a website provides a quick and easy way of communicating information between buyers and sellers. You can list your opening hours,

contact information, show images of your location or products, and use contact forms to facilitate enquiries from potential customers or feedback from existing ones. You can even upload promotional videos to really engage your customers and sell your business in an effective and cost efficient way. This is also a good way to promote your social media channels and build up a community with your customers.

3. Credibility: In today's modern world, there is an expectation for any reputable company to have some kind of online presence. Potential customers would likely be distrusting of any business that didn't have a telephone number or a physical address, and the same can be said for not having a website and email address. These are useful tools to share crucial information about your business with customers and answer all the What's and Why's that they may have. What's more, having a good quality, easy-to-use website makes customers feel comfortable using your services, as they will assume they can expect the same positive experience in all areas of your business.
4. It Cuts Costs: As well as simply displaying information, you can also use your website to sell goods & services directly to consumers, in some cases removing the need to use "brick-and-mortar" stores which involve large operating costs (staff wages, rental, utilities to name just a few). Eliminating these overheads will also allow you to lower your prices, giving your business that real competitive edge. It can also be used internally within your business; do you have any news you want to share with colleagues or have any important information that can be accessed by management? Having an internal website can save you a lot of time as everything you need is one place and can be accessed at any time.
5. Market Expansion: As your site is accessible to anyone all over the world, the ability to break through geographical barriers has never been easier. Anyone, from any country, will be able to find your company and as such, is now a potential customer.
6. Consumer Insights: Analytic tools allow you to identify who your typical customer is, how they found you, what they like, and adapt your business to maximise purchases through your site. The diverse range of data available can also help you better understand how your social media channels affect your brand, and can even highlight opportunities to change the offline aspects of your business such as branch opening times, promotions and product ranges.
7. Advertising: Tools like Google AdWords or advertising on Facebook give you the power to reach customers with much more accuracy and reliability than with traditional offline advertising methods. SEO and online advertising are a great way to help build up awareness, if it's done correctly traffic to your website can see an increase. Be the first company that a potential new customer sees when searching for a specific product or service online, and use your website's contact page or e-commerce features to make purchasing a product or finding a retail outlet easier than ever before.
8. Competitors Online: If you don't have a website it is highly likely that your competitor will do, this means that you are missing out on gaining new customers and can be in the forefront of their minds. It is crucial that no opportunities are missed and are gained by the competition.
9. Customer Service Online: Websites provide an easier way to handle customer service. Offering answers to regularly asked questions in a FAQ (Frequently Asked Questions) section, you can reduce customer service costs and save yourself time and money, as well as providing much more information. This also means that customers can receive a reply instantly and saves time, which helps to encourage positive customer relations in the long run. This could be a benefit for you, all positive feedback can be uploaded into a testimonial, your customers are happy why not show it off?!
10. Growth Opportunity: Websites, in general, are great ways to in providing a place that potential investors can be referred to. It shows what your company is about, what it has achieved and what it can achieve in the future.

Navigating Through the www.ehjmodelColege-ilorin.com website

1. Open the internet browser you wish to use e.g. Mozilla Firefox

2. Type the URL into the address bar i.e. www.ehjmodelColege-ilorin.com
3. You can either choose to press the ENTER key on your keyboard or click on the arrow in the address bar to direct you to the website.

Practice questions:

1. Navigate through these websites and write report on what they are into

(i) www.waeconline.org
(ii) www.gtvnigeria.com
(iii) www.itbeginswithyou.org
(iv) www.unilorin.edu.ng
(v) www.nuc.edu.ng

2. Briefly explain the following terms:
   (a) Website
   (b) Protocol
   (c)Webpage
   (d) e-commerce
   (e) e-mails
   (f) ping
   (g) packet
   (h) system administrator
   (i) gopher
   (j) home page
   (k) Intranet
   (l) Worm
   (m) URL
   (n) Download
   (o) Firewall
   (p) Baud
   (q) Cache
   (r) Authentication

3. List two differences between LAN and WAN
4. Distinguish between an email address and a website address
5. List one example each of:
   (a) email address
   (b) website address

6. briefly explain any three of the following concepts in electronic mails:
   (i) CC
   (ii) BCC
   (iii) Domain name
   (iv) Recipient
   (v)Inbox
7. Write short note on the following
   (i) E-mail
   (ii) www.yahoo.com
8. Differentiate between Internet and World Wide Web
9. What is the relationship Hypertext transfer protocol and Hypertext markup language?

LESSON THREE

SOFTWARE FOR WEB DEVELOPMENT

1. WordPress – The most popular website building platform

WP is a blogging platform developed in PHP language and it supports building your website on your own server with PHP/MySQL database. As one of the best web development tools, the software can be used as CMS (Content Management System) to set up a commercial website. Its features include: the WYSIWYG text editor, co-authoring with multiple authors, permalinks optimized for search engines, static page, Trackback/Pingback, member registration/login,etc.

Main features:

- Easy to install and get started, with dozens of site-building tools included.
- Rich third-party plugins for the use of expanded features, flexible and powerful.
- Various site templates and themes are free to use.
- SEO optimized, and friendly for high SERP.
- Robust community support, with thousands of developers contributing and reviewing WP, safe and active.

2. Mockplus – An all-in-one design tool for web, mobile and desktop projects

As an all-inclusive design tool for designers and developers, Mockplus can be used to create faster, smarter and easier website prototypes with simple drag-and-drop, supporting mobile and desktop apps prototyping too. With a singular mission to keep users focused on design itself rather than the tool, the software has offered a number of incomparable features to make better design and development.

Main features:

- A set of ready-made components (3000) and icons (200) are included for your rapid prototyping.
- It offers not a few features to improve the design efficiency of making repetitive webpage elements and layouts, such as the Repeater, Auto Data Fill, Format Painter and Paste Style.
- The most comprehensive way to preview and test out your project, including: Export to image, Export to demo package, publish to online and offline HTML, view on mobile app using QR code, etc.
- The MindMap and UI Flow design mode can help quickly reflect design ideas and lay out project structure.

3. Macaw – The best web design software for code-savvy people

Out of the best website design tools, Macaw sets itself apart by providing the same flexibility as your favorite image editor but also writes semantic HTML and CSS. Also, it gives the possibility to make a responsive webpage with beautiful typography and system fonts, letting you style the elements at once. If you are looking for free website design software with moderate learning curve and flexibility, then don't miss out the software.

Main features:

- Save your design elements in your own library for later use.
- The Alchemy tool can convert your design elementin to CSS or HTML codes.
- There is a real-time layout engine letting you manipulate your design elements with ease.
- Your whole website will be optimized for all devices.

4. Weebly – The easiest web builder among the newbies and professional designers

As one of the most popular website development tools among people who want to start their own sites, Weebly is very easy-to-use and aimed at personal, business and professional websites. Above all, it enables you to make site-building work without any coding experience, meanwhile you can choose to edit the HTML/CSS if you have the coding background.

Main features:

- More than 40 layout designs, including website maps and portfolios to help you spark in web design and development.

- Lots of info buttons, pop-ups, lists and email sequence to take good care of your workflow.
- Easy switch between responsive and trendy templates/themes available on the application.

5. Adobe Dreamweaver – One of the most trustworthy web developer tools

This is a proprietary web development tool from Adobe Systems, available for both macOS and Windows. Besides, it provides a nice environment for you to work on the web, which combines with a code editor along with a live view. Another cool thing is the software offers free trial, which gives you some time to experiment and see whether it's right for you.

Main features:

- It offers adaptive grid.
- It enables you to write and edit any code, which includes JavaScript, HTML, CSS and XTL.
- Its WYSIWYG interface lets you view how the end result will look like while creating.

6. Microsoft FrontPage

Microsoft FrontPage (full name Microsoft Office FrontPage) was a WYSIWYG HTML editor and website administration tool from Microsoft for the Microsoft Windows line of operating systems. It was branded as part of the Microsoft Office suite from 1997 to 2003. Microsoft FrontPage has since been replaced by Microsoft Expression Web and SharePoint Designer, which were first released in December 2006 alongside Microsoft Office 2007, but these two products were also discontinued in favor of a web-based version of SharePoint Designer, as those three HTML editors were desktop applications.

7.Google Web Designer

Google Web Designer gives you the power to create beautiful, engaging HTML5 content. Use animation and interactive elements to bring your creative imagination to life, and enjoy seamless integration with other Google products, like Google Drive, DoubleClick Studio, and AdWords. The Google Web Designer provides interactive, animation and responsive features for a designer to utilize with easy workflow. The Google *web design tool*, interactive Ads can be designed well. Components, events, and page are the most useful functionality for creating interactive Ad. The robust animation tools will set a mode as per your choice, and you can create and manipulate 3D content using the power of CSS3. You can give transformations and transitions to your object as you author.

8. Sketch

Sketch web design tool has made for Specific OS like Mac. And a user must purchase the license to go with professional use to design web and application using Sketch. The sketch is truly useful and productive in the exploration and UX phase of the design procedure. In Sketch, The designers can utilize an intuitive interface and powerful plugins that help designers to get more focus on desired output. Sketch interface is commonly simple to get used to for responsive design.

With Libraries, you can collaborate and share Symbols with other designers, across all your documents — and always stay up to date. Design once, Reuse anywhere and update easily is the most highlighting functionality of Sketch. The sketch is one of the *top web design tools* which is in demand for design iOS web apps.

9. Figma

Figma is the first interface design tool based on the browser. One platform provides multiple tasks like design, prototyping, and communication from the same podium. One can easily move from design to prototyping without syncing or exporting files. Figma is one of the *top web design tools* which is known as a powerful editing tool, in which designer can use various tools like boolean operations, gradients and fills.

Figma is the best for building UI, and the components allow reusability elements across your designs. Figma available on the Windows, Mac, and Linux browser or desktop. Using Figma, a dynamic and digital product can be code as programmatically.

10. Photoshop

A website is all about image and text. Photoshop is better for website design. Photoshop is a fantastic program and is used for many web designers to handle some of their most required web design needs.

List of features in Photoshop CC

Linked smart objects

- Layer Comps
- Smart guides
- Web fonts
- Color Management
- CSS generation
- Image assets generation

11. Pixlr

Pixlr Editor allows users to access a host of powerful image editing features from any computer with an internet connection. Pixlr has a clear and logical interface as the feature. A responsive and faster use is possible in Pixlr.

On the off-chance that you have used Photoshop sometime recently, then the "Pixlr Editor" will be very familiar. Pixlr even opens. PSD documents and holds all the first layers, making it an extraordinary other option to Photoshop.

Strong adjustment tools including Curves and Levels

- Full-screen mode maximizes workspace and makes it feel like a desktop application
- Extensive range of filters for artistic effects

12. Hologram

The hologram is a web design tool where all in one Web-VR creation happens. The hologram is an explorer desktop app that allows you to create prototype Web VR in an interactive way.

It doesn't require any programming knowledge. So anybody can start VR designing on hologram web VR design tool.

The hologram 3D visual interface tool has designed specifically for fast and intuitive 3D work. A designer can use the Scene for turning their vision into Virtual Reality.

Assets - A designer can manage all the asset like images/textures, sounds, videos, and 3D objects. For adding/downloading free 3D object created by the Google Blocks community, Hologram integrated with Google Blocks natively.

For VR web design, the hologram is the *top web design tool* among all.

13. Mobirise

The Mobirise is a rising *web design tool* or software for creating a mobile-friendly website. Mobirise is totally free and no need to write code. The Mobirise can be a *top web design software in 2018*. It is best for Windows and Mac to utilize the features.

Non-techies who are not familiar with the complexities of web designers and developers who want to work without bearing the code, Mobirise is the worth one. The automagically feature is going to adapt the mobile-friendly features itself once the website is going to set with internal functions coded inside the Mobirise.

14. Canva

A wireframe is playing a crucial role before a website design begins. Canva is multi-solution podium where a user can create social media posts, documents in reference to a presentation and corporate letters, blogging, and e-books, and marketing materials and so on.

Features of Canva that helps to create better web design

Save time with our easy-to-use interface

- Effortlessly share your web wireframe
- Drag and drop everyday web features
- Generate masterful layouts in minutes
- Polish your wireframe with our rich bounty of features

15. Material UI

Material Design is Google's visual dialect, including points of interest on activity, style (shading, images, pictures, typography), format, parts, and examples. Material-UI is a "CSS Framework and a Set of React Components that Implement Google's Material Design."

The Material-UI site consolidates design projects for you to look at, and furthermore headings on the most capable strategy to begin using this visual dialect in your own activities.

LESSON FOUR

CABLES AND CONNECTORS

Network cables can be defined as the cable that are used to connect one electronic device to another or to connect two or more computers/ devices to share information amongst other things. Cable is the medium through which information usually moves from one network device to another.

There are several types of cables which are commonly used with LAN, the type of cable chosen for a network is related to the network's topology, protocol and size.

Types of Network cables

1. Twisted pair network cable
   (a) Unshielded Twisted pair (UTP) network cable
   (b) Shielded Twisted pair (STP) network cable
2. Coaxial network cable
3. Fibre Optic network cable
4. Telephone Cable

Twisted pair network cable

The use of two wires twisted together helps to reduce crosstalk and electromagnetic induction. While twisted-pair cable is used by older telephone networks and is the least expensive type of local-area network (LAN) cable, most networks contain some twisted-pair cabling at some point along the network.

Twisted pair cabling is often used to help avoid certain kinds of signal interference. Two different types of twisted pair cable, unshielded twisted pair (UTP) and shielded twisted pair (STP) are used in different kinds of installations. UTP is common in Ethernet installations, while STP is used in various kinds of networks to prevent crosstalk and electromagnetic interference. STP cable can also help to provide grounding.

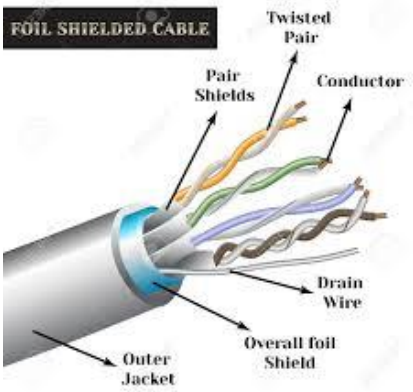
In general, twisted-pair cabling may be preferred over a common alternative, coaxial cable, for different reasons. Coaxial cable involves a single, thicker wire. Many of those who use this type of cable claim that twisted pair has a more accommodating bend radius, is easier to terminate, and provides more versatility in selecting network topologies. Different kinds of twisted-pair cable are rated by industry standards including ISO/EIC and EIA/TIA.

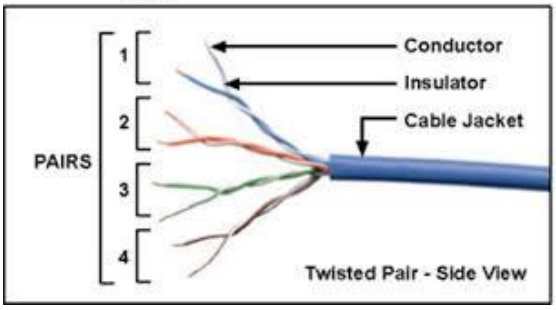
Unshielded twisted pair (UTP)

- 'Unshielded' meaning it does not rely on physical shielding to block interference
- Most commonly used cable of the two, often utilized for both residential and business use
- There are several UTP categories, which increase in bandwidth as you move up the scale, for example:
  - CAT1 = up to 1Mbps | CAT2 = up to 4 Mbps | CAT5e = up to 1Gbps

Shielded twisted pair (STP)

- 'Shielded' with a foil jacket to cancel any external interference
- Commonly used for large-scale enterprises for high-end applications as well as exterior cabling that may be exposed to environmental elements.





Coaxial Cable

Coaxial cable, or coax is a type of electrical cable that has an inner conductor surrounded by a tubular insulating layer, surrounded by a tubular conducting shield. Many coaxial cables also have an insulating outer sheath or jacket. The term coaxial comes from the inner conductor and the outer shield sharing a geometric axis. Coaxial cable was invented by English engineer and mathematician Oliver Heaviside, who patented the design in 1880. Coaxial cable differs from other shielded cables because the dimensions of the cable are controlled to give a precise, constant conductor spacing, which is needed for it to function efficiently as a transmission line. Coaxial cable is used as a transmission line for radio frequency signals. Its applications include feedlines connecting radio transmitters and receivers to their antennas, computer network (Internet) connections, digital audio (S/PDIF), and distributing cable television signals. One advantage of coaxial over other types of radio transmission line is that in an ideal coaxial cable the electromagnetic field carrying the signal exists only in the space between the inner and outer conductors. This allows coaxial cable runs to be installed next to metal objects such as gutters without the power losses that occur in other types of transmission lines. Coaxial cable also provides protection of the signal from external electromagnetic interference.

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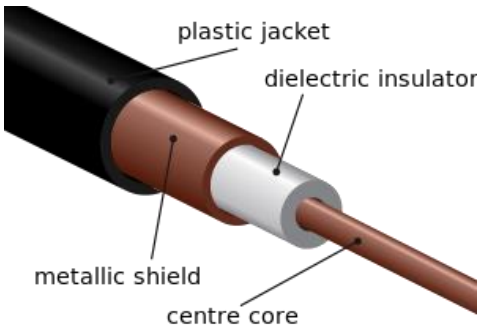


This type of cable is commonly used to deliver TV signals (its higher bandwidth makes it more suitable for video applications) and to connect computers in a network. Along with stable transmission of data, coaxial cables also have anti-jamming capabilities and can effectively protect signals from being interfered. The cost is slightly higher than twisted pair but still considered more economical than fiber. There are also two types of coaxial cables:

75 Ohm

- Most commonly used to transmit video signals
- Often connects video signals between different components like DVDs, VCRs, or receivers commonly known as A/V cables

50 Ohm

- Primarily utilized to transmit a data signal in a 2-way communication system
- Most commonly used for computer Ethernet backbones, AM/FM radio receivers, GPS antenna, police scanners, and cell phone systems

Fiber Optic Cables

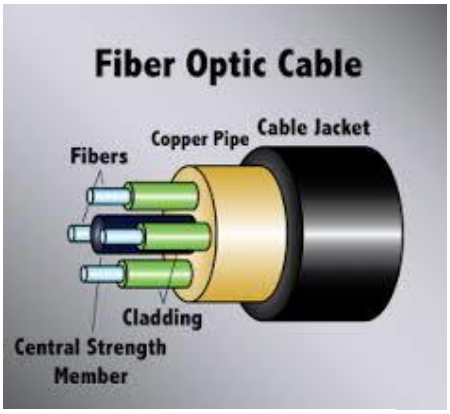
Fiber is the newest form of transmission cable technology. Instead of transferring data over copper wires, these cables contain optical fibers that transmit data via light, rather than pulses of electricity. Each optical fiber is individually coated with plastic layers and contained in a protective tube, making it extremely resistant to external interference. The result is a very reliable and super fast connection that has 26,000X more transmission capacity than twisted-pair cables, but that also comes with a much higher cost. Again, there are two types of fiber cables:

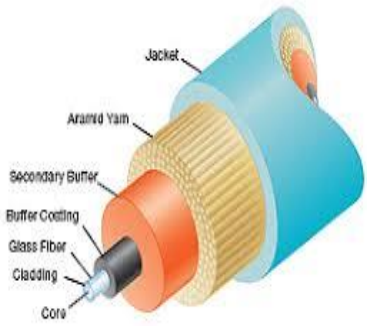
Singlemode

- Has a small core and only allows one mode of light to propagate at a time
- Because of this, the number of light reflections decrease as they pass through the core
- The result is low attenuation and data that is able to travel further and faster
- Commonly used in telecom, CATV networks, and Universities.

Multimode

- Has a larger core diameter that lets multiple modes of light propagate
- The amount of light reflections increase as they travel through the core, which allows more data to pass through
- Because of its high dispersion, multimode cables have lower bandwidth, higher attenuation and reduced signal quality further it travels
- Most commonly used for communication over short distances such as LAN, security systems, and general fiber networks.





Telephone Cable

A telephone line or telephone circuit (or just line or circuit within the industry) is a single-user circuit on a telephone communication system. This is the physical wire or other signaling medium connecting the user's telephone apparatus to the telecommunications network, and usually also implies a single telephone number for billing purposes reserved for that user. Telephone lines are used to deliver landline telephone service and Digital subscriber line (DSL) phone cable service to the premises. Telephone overhead lines are connected to the public switched telephone network.

CABLE CONNECTORS

This is an electrical connective device for joining electrical circuits together. The connection may be temporary, as for portable equipment or may be requiring a tool for assembly and removal or may be permanent electrical joint between wires or devices.
The common connectors are:

1. The Registered Jack 45 (RJ 45)
2. The Registered Jack 11 (RJ 11)
3. T –connector

The Registered Jack 45 (RJ 45)

A registered jack (RJ) is a standardized physical network interface for connecting telecommunications or data equipment. The physical connectors that registered jacks use are mainly of the modular connector and 50-pin miniature ribbon connector types. The most common twisted-pair connector is an 8-position, 8-contact (8P8C) modular plug and jack commonly referred to as an RJ45 connector. An 8-pin/8-position plug or jack is commonly used to connect computers onto Ethernet-based local area networks (LAN).



The Registered Jack 11 (RJ 11)

RJ-11. RJ-11. (Registered Jack-11) A telephone interface that uses a cable of twisted wire pairs and a modular jack with two, four or six contacts. RJ-11 is the common connector for plugging a telephone into the wall and the handset into the telephone.


Tee connector (T –connector)

A tee connector is an electrical connector that connects three cables together. It is usually in the shape of a capital T. It is usually used for coax cables and the three connector points can be either female or male gender, and could be different or the same standard, such as F type, BNC or N type.

BNC Connector

The BNC connector is a miniature quick connect/disconnect radio frequency connector used for coaxial cable. It features two bayonet lugs on the female connector; mating is fully achieved with a quarter turn of the coupling nut.



Fibre optics Connector

Ethernet cable summary

Specification	Cable type	Maximum length
10 Base T	Unshielded Twisted Cable	100 metres
10 Base 2	Thin Coaxial	185 Metres
10 Base 5	Thick Coaxial	500 Metres
10 Base F	Fibre Optics	2000 Metres
10 Base T	Unshielded Twisted Cable	100 Metres
10 Base Tx	Unshielded Twisted Cable	220 metres

Tutorial Questions

1. List two types of cables
2. what is the advantages of Registered jacks 11 (RJ11) over other connectors
3. What is a network cable?
4. State three types of cables used in computer networking
5. write the acronym VSAT in full

LESSON FIVE

COMPUTER CABLES AND CONNECTORS

There are several kinds of cables computers used to connect different types of peripheral devices, such as

i. Power Cable
ii. Data Cable

Power Cables

A power cable is an assembly of two or more electrical conductors, this is a cord or cable that temporarily connects an electrical appliance like a computer to the distribution circuits of an electrical power source via a wall socket or extension cord. Power cables may be installed as permanent wiring within buildings, buried flexible power cables are used for portable devices mobile tools and machinery.

Data Cables

A data cable is any media that allows base band transmissions (binary 1, 0's) from a transmitter to a receiver. It is used to transmit information between system bus and peripheral devices such as printer, monitor, modems, mouse etc.

Examples of Data cables are:

1. *Printer Cables*: This cable carries data information between a computer and a printer. However there are different types of printer cable depending in the type of printer used. Most modern printers with latest technology make use of the USB printer cable, while other types of printer cables are: serial printer cable, parallel printer cable, fire wire, USB printer cable.
2. *Universal Serial Bus (USB*): This was designed to standardize the connection of computer peripherals such as keyboards, pointing devices, digital cameras, printers and network adapters to personal computer both to communicate and to supply electric power
3. *Monitor Cable:* this is a lead used for transmitting video signals. Video graphics array (VGA) cable is most commonly used to link computers with monitor. However, it is now used on some high definition television, this is known as Video Graphics Adapter (VGA) cable. A standard VGA connector has 15pins connecting a computer to a monitor, you may also use a VGA cable to connect your laptop to a TV screen or a projector. A VGA connector is a three-row 15-pin DE-15 connector. The 15-pin VGA connector is found on many video cards, computer monitors and some high definition television sets.
4. *Serial Data Cable (ps/2):* The ps/2 (personal system 2) ports are simple 6-pin, low-speed serial connections commonly dedicated to a keyboard and mouse. Although these ports may look identical at first glance, they are not interchangeable, so you will need to be extremely careful to attach the keyboard and mouse to their respective ps/2 port.
5. *Firewire (IEEE 1394*): Fire wire, otherwise known as IEEE 1394, iLINK or lynx, is a faster alternate to USB and commonly used for connecting digital camcorders and external and external hard drivers to a computer, fire wire typically has 6-pins in its connector, though a 4-pin variety is common as well.
6. *eSATA Cables:* this is used internally for connecting the hard drive to the computer's motherboard, eSATA cables are designed for portable nard drives and can transfer data faster

than USB or fire wire. However the eSATA cables cannot power an external hard drive with eSATA.

MALE AND FEMALE CABLE CONNECTORS

Male Connector

A male connector is a connector attached to a wire, Cable or piece of hardware, having one or more exposed unshielded electrical terminals and constructed in such a way that it can be inserted into a receptacle (female connector) to ensure a reliable physical and electrical connection.

This type of connector is also known as a plug. A male connector can be recognized by the fact that, when it is disconnected or removed, the unshielded electrical prongs are plainly visible. The most common male connector is a two-or-three-prong plug attached to the end of the cord for an electrical appliance, while other examples are the plugs for headsets, most connectors on the ends of lengths of coaxial cable, and the edge connectors on some printed circuit cards.

Female Connector

A female connector is a connector attached to a wire, cable or piece of hardware, having one or more recessed holes with electrical terminals inside, and constructed in such a way that a plug with conductors (male connectors) can be inserted into it to ensure a reliable physical and electrical connection. A female connector is also known as a jack, outlet or receptacle. These types of connectors can be recognized by the fact that, when it is disconnected or removed the electrical conductors are not directly exposed and therefore are not likely to make accidental contact with external objects or conductors. The most common female connector is a two-or three-prong electrical outlet also known as a wall outlet, while other examples are telephone jacks, the jacks for headsets, the chassis connectors for Coaxial Cable and some D-shell connectors for computer (serial and parallel ports).

LESSON SIX
SECURITY AND ETHICS

Security breaches

Security breaches is a computer refers to a situation whereby there is unauthorized acquisition of computerized data or information of a person or group of persons thereby gaining access to their secrets or security issues. It may also mean unauthorized access to the computer set-up program thereby changing the way and manner a user normally logs in to his account.

Sources of security

1. Virus, worms, and Trojan horses
2. Poorly implemented network
3. Lack of adequate ICT policy
4. Careless handling of information on the net, without careful screening
5. Hackers

Sources of virus attacks

1. Downloadable program
2. Cracked software
3. Email attachments
4. Internet
5. Booting from CD

VIRUS, WORMS AND TROJAN HORSES

Generally people refer to worm or Trojan Horse as a virus because they are often used interchangeable, However they are not exactly the something.

VIRUS: A computer virus attaches itself to a program or file enabling it to spread from one computer to another, leaving infection as it travels. Like a human, virus, a computer virus can range in severity. Some may cause only mildly annoying effects while others can damage your hardware, software of files. Almost all virus are attached to an executable file, which means the virus may exist on your computer but it actually cannot infect your computer unless you run or open the malicious program. However it is important to note that, a virus cannot be spread without a human action, (such as running an infected program) to keep it going or spreading computer virus by sharing infecting files or sending email with viruses as attachments in the email.

WORM: A worm is similar to virus by design and I considered to be sub-class of a virus. Worm spread from computer to computer, but unlike a virus, it has the capability to travel without any human action. A worm takes advantages of file unaided. The biggest danger with a worm is its capability to replicate itself on your system, so rather than your computer sending out a single worm, it could send out hundreds or thousands of copies of itself, creating a huge devastating effect. One example would be for a worm to send a copy of itself to everyone listed in your e-mail address book.

TROJAN HORSE: A Trojan horse is full of as much trickery as the mythological Trojan Horse, it was named after. The Trojan horse, at first glance will appear to be useful software but will actually do damage once installed or run on your computer. Those on the receiving end of a Trojan Horse are usually tricked into opening them because they appear to be receiving legitimate software or files from a legitimate source. When a Trojan Horse is activated on your computer, the results can vary. Some Trojan are designed to be more annoying than malicious (like changing your desktop, adding silly active desktop icons) or they can cause serious damage by deleting files and destroying information on your system. Trojans are also known to create a back door on your computer that gives malicious users access to your system. However, unlike virus and worms, Trojans do not reproduce by infecting other files nor do they self-replicate.

Preventive measures against security breaches

The following are some of the preventive measures that can be taken against computer security breaches.

1. Use of antivirus software: Antivirus software prevent virus from damaging your vital information. Most of the antivirus is licensed but they also have freeware versions available online or come with your new laptop/desktop. Popular antivirus software around are:
    i. Avast antivirus
    ii. Mc Afee antivirus
    iii. Norton antivirus
    iv. AVG antivirus
    v. Nod 32 antivirus
    vi. Eset antivirus
    vii. G Data antivirus etc.
2. Use of firewall: This is a system that prevents unauthorized user and access to your computer. A firewall can be either hardware or software and can be install or set it active if already installed on the system. Hardware firewalls provide a strong degree of protection from most forms of attack coming from the outside world and can be purchased as a stand-alone product or in broadband routers. Software firewall protect your computer from outside attempts to control or gain access to your computer, and usually provides additional protection against the most common Trojan program or e-mail worms.

3. Exercising care in opening e-mails attachments: the idea is that do not open a mail you do not know the source or that you have not subscribed.
4. Encryption: This is a process of adding security features to your personal documents such as passwords, such documents cannot be accessed without the right password.
5. Using sites with certificates: Most websites do not just exist, they have certificates which ensure that they are online and hosted by a particular web hosting company.
6. Proper network implementation and policy.
7. Exercising care in giving out personal and vital information

Legal issue to be consider when using ICT

Issues of legal importance to consider when using ICT including the following:

1. Copyright: This is a legal concept, enacted by most governments, giving the creator of original work exclusive rights to it, usually for a limited time.
2. Ownership rights: This refers to legal ownership of a property and has the right to use it and has full control over it unless prevented by some agreement. Ownership rights may include right to text, images, audio, video etc.
3. Privacy: The unauthorized reproduction or use of a copyrighted book, recording television program, patented invention, trademarked product etc.
4. Cyber crime: any crime that involves a computer and a network, it includes identity theft, internet fraud and so on.
5. Hacking: This mean gaining unauthorized access to resources with the intention to cause harm.

Tutorial Question

1. State one difference between a hacker and a scammer
2. List five ways of preventing computer virus in a data processing centre
3. Define computer virus
4. List three types of computer virus
5. State five sources of computer network security breach.
6. Write short note on the following:
7. (a) copyright
   (b) spam
   (c) malware
   (d)hacking
   (e)encryption
8. List four warning signs of the presence of virus in a computer system
9. State four preventive measures against computer security breaches that a computer administrator should apply
10. List four warning signs of the presence of virus in a computer system.

LESSON SEVEN

GRAPHICS PACKAGE

Graphics package is a collection of programs that helps to generate graphic displays. Examples of graphics packages include: Paint, CorelDraw, Instant artist, Harvard graphics, Photoshop, Logo graphics, Freelance, Print Artist etc.

A person who was good at performing numerical calculations was called a human computer much before computers came into being. The use of mechanical calculating devices made his task less demanding. The use of punched paper cards to run jacquard looms came up around 1800. The development of transistors followed by microprocessors based on integrated circuits led to the size of the computers becoming smaller and its price also came down.

Designing with computers is called computer aided designing (CAD) and textile designing with computers is called computer aided textile designing (CATD).

Designing with computers offers so many advantages that engineers, technologists, professionals and so many others make use of them in their everyday work. Some of the major advantages are:

- We can save a lot of time and labour.
- We can make designs with very great accuracy.
- We can make a number of colour combinations of one design in a very short-time period.
- We can make very complicated designs with different texture and colour effect very easily.

Important Graphics Programs

Some of the important graphics programs, which are used by designers, are given below:

- CorelDraw
- Corel Photo-paint
- Adobe Photoshop
- Adobe Illustrator
- Macromedia Freehand
- Macromedia Fireworks
- L-View
- U-Lead

Getting Started with CorelDraw

CorelDraw is one of the most popular and powerful graphics programs and gives designers a most rewarding and enjoyable work experience. It is built and designed to meet the day-to-day demands of working designers.

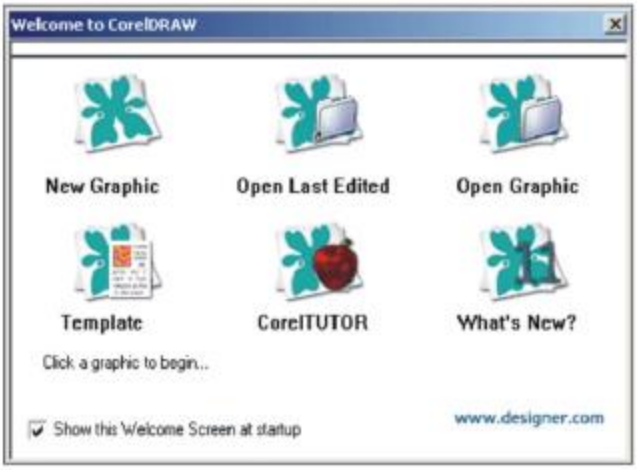
CorelDraw software is available in the market and once loaded onto the computer, you can get started with your designing work.

Opening CorelDraw

- Switch on the computer and take the following steps:
- Go to Start and select Programs from the list. (The welcome screen at start-up is shown in the next figure).
- Find the Corel section and select CorelDraw.
- Choose Open Graphic for old design. New Graphic creates a new, one page document. Template allows access to professionally created templates from the library. Corel Tutor gives a brief overview of how to use the program.
- 'What's New?' shows improvements over the earlier Version. Designer.com connects you to a web site where you can find many helpful areas.

CorelDraw application window

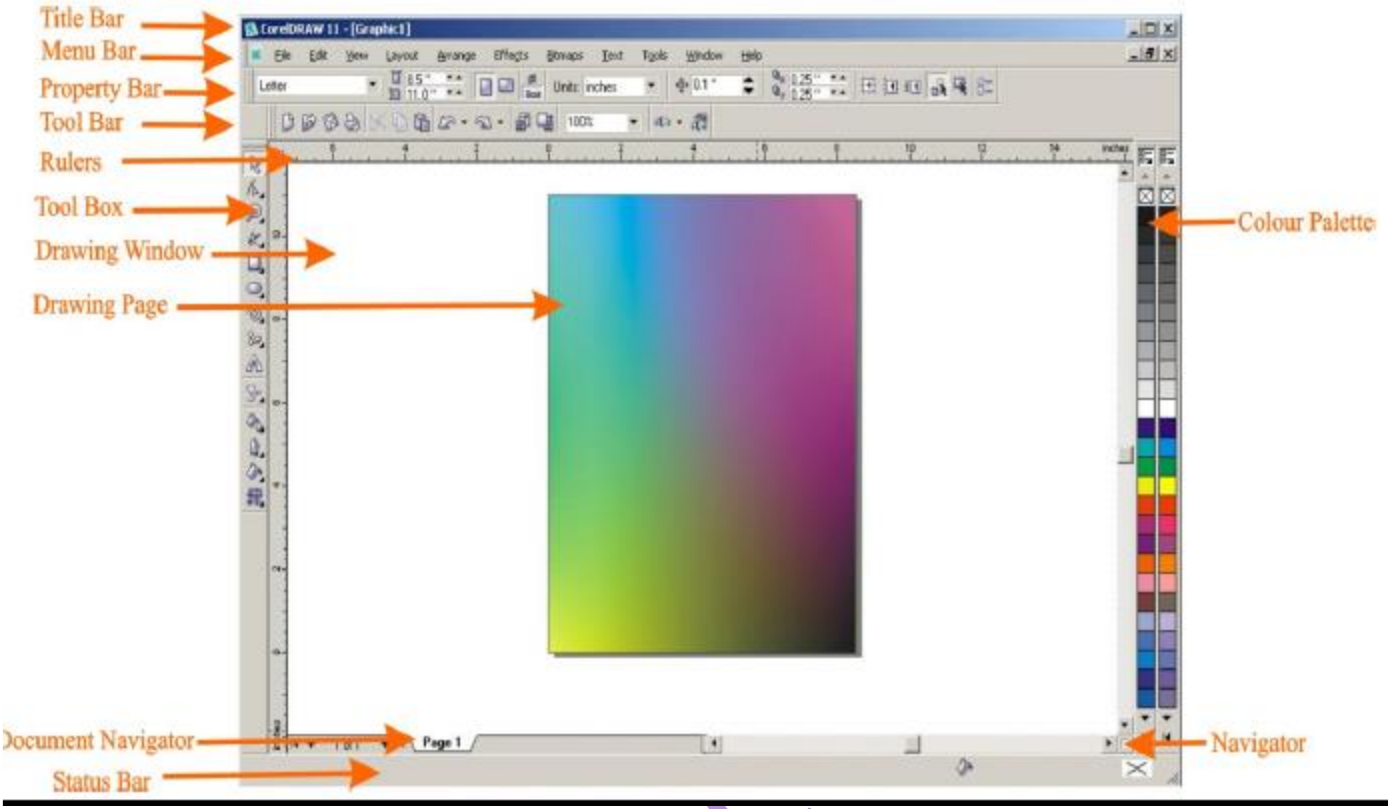
The CorelDraw application window looks like the one illustrated here.



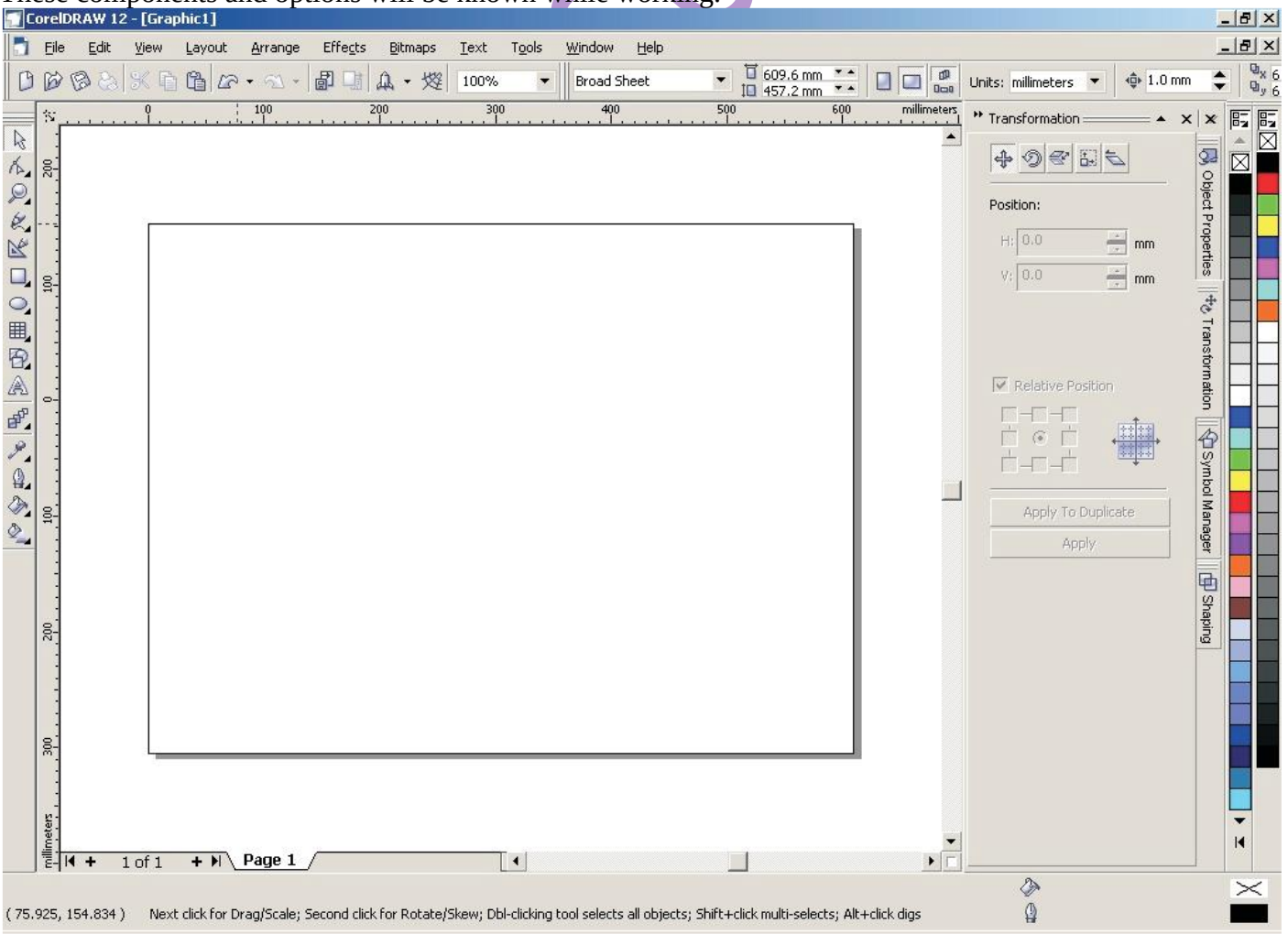
1.3.3 Window components

The various window components in CorelDraw are:

i. Title bar
ii. Menu bar
iii. Property bar
iv. Tool bar (Standard)
v. Tool box
vi. Rulers
vii. Drawing page
viii. Drawing window
ix. Colour palette
x. Docker
xi. Status bar
xii. Document navigator
xiii. Navigator

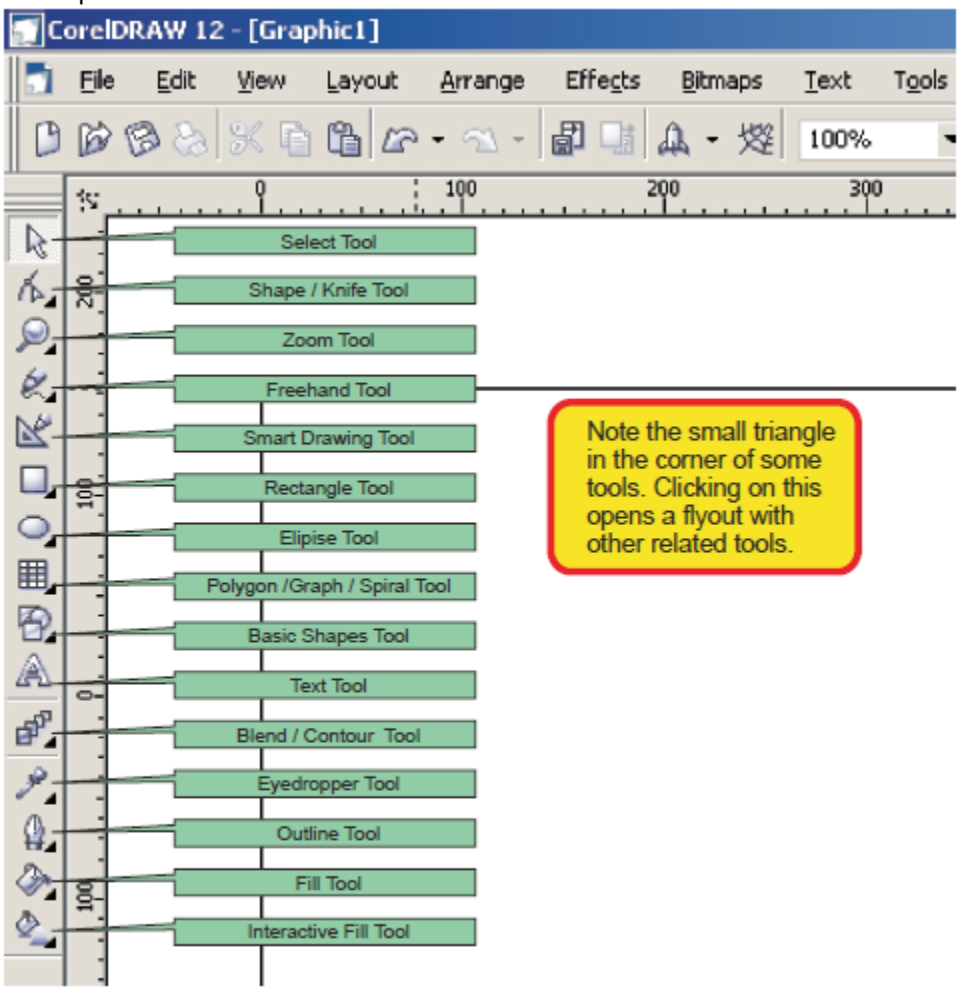


These components and options will be known while working.



Tools Overview

Take a tour of the Toolbox. By default this resides on the left hand side of the screen but it can be moved anywhere else, sometimes inadvertently, particularly if you use a laptop computer with a touch mousepad!



The Toolbox is located in the left portion of the window and contains all the drawing and editing tools necessary to create objects for an illustration. Tools containing a small triangle in the corner produce a Flyout. These are described as:

	Pick Tool Selects objects. Once selected, you can use the Pick Tool for move, stretch, scale, rotate, and skew objects.
	Shape Tool Reshapes objects by moving nodes, lines, and control points.
	Zoom Tool changes the current view of the drawing.
	Freehand Tool draws lines and curves. You can also use this tool to trace bitmaps.

	Smart Drawing Tool converts the freehand strokes you draw to basic shapes and smoothed curves
	Rectangle Tool draws rectangles and squares. Squares are created by using the Control key while drawing.
	Ellipse Tool draws ellipses and circles. Circles are created by holding down the Control key as you draw.
	Graph Paper Tool draws a collection of boxes that simulate a sheet of graph paper.
	Perfect Shapes Tool - A collection of objects, which you can add to your drawing.
	Text Tool - Adds either Artistic or Paragraph text to your drawing.
	Interactive Blend Tool - Allows you to merge objects.
	Eyedropper Tool - Allows you to select a color within an object, especially a bitmap, and allows you to apply that color to another object.
	Outlines Tool - Sets the outline style of an object or a line. This includes the line type, ends, color, and weight.
	Fill Tool - Assigns the fill style of any object.
	Interactive Fill Tool - Allows you to apply Fountain fills (gradients) using the mouse. The flyout gives access to the Mesh fill Tool.

Note: The fly out tools of all the main tools helps us in creating intricate designs more easily, and makes the task easy.

Dockers

A Docker is a type of dialogue box that can reside on the screen to allow you quick access to commands, provide information about your work, to allow you to modify your work, to control your drawing in many ways.

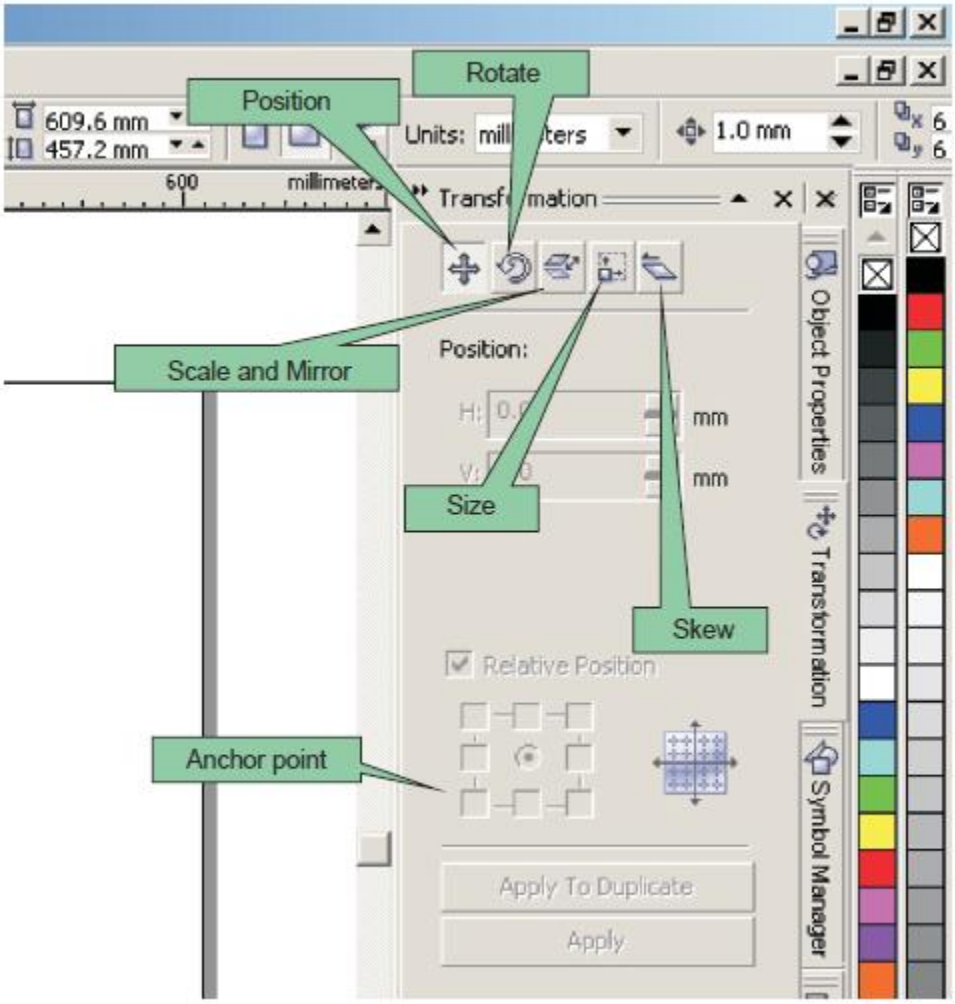
There are a number of dockers that you may choose to keep open at all times. They can be minimized to keep your workspace as large as possible but are readily accessible, and can be closed down if you don't use them very frequently.

Dockers that are particularly useful and worth keeping open all the time are: the Object Properties Docker; the Transformation Docker; the Shaping Docker; the Undo Docker and the Object Manager Docker.

Dockers are opened through the Window drop-down menu.

The Transformation Docker

The Transformation Docker enables us to modify the objects we create or import in a precision way. We can move objects to a precise location, rotate, mirror, size and skew accurately.



The Shaping Docker

The **Shaping Docker** lets you achieve the following things; **Weld, Trim and Intersect**. Late versions of CorelDRAW have added more functions to the shaping Docker that advanced users may find useful but of all the functions Weld and Trim will be found to be powerful tools that are the most useful.

In each function you are given the option to leave the original Source object and/or Target object. Checking these tick-boxes when you use these functions will create duplicate objects. This is useful for advanced users with good planning skills and enables better productivity.

It is advised that you leave these tick-boxes unchecked until you are fluent with using the Shaping tools.

The Source Object is the object you originally select to weld or trim. The Target Object is the object you subsequently act upon. It is important to understand that using these tools will affect the properties of the objects you are working with. The source object will take on the properties of the target object.

The best way to understand how these tools are used is by example.

Weld.

Draw a rectangle. Now draw a second rectangle that overlaps the first. Apply a colour fill to the second rectangle.

With the second rectangle selected, click Weld and with the arrow cursor that appears click on the first rectangle.

You will find the two rectangles have combined into a single object **without a fill.**

Try this again, this time selecting the first object and welding this to the second. You will achieve the same shape but **this time the new object has a fill**.

Trim

Draw 2 rectangles as before. Select one and trim this to the other.You will find that the **target object** has a piece missing where the source object overlapped.

Using the shaping tools automatically converts objects to curves.

The Weld Command

The Weld command creates a single curve from 2 or more components. The components may overlap, sit next to each other or be some distance apart.

You are given the option to leave the original Source object and/or Target object. Checking these tick-boxes will create duplicate originals. This is useful for advanced users with good planning skills and enables better productivity. It is advised that you leave these tick-boxes unchecked until you are fluent with using the Shaping tools. The Source Object is the object you originally select to weld or trim. The Target Object is the object you subsequently act upon.

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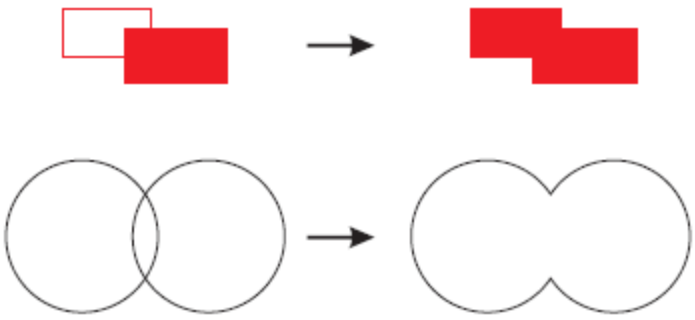
Draw a rectangle. Now draw a second rectangle that overlaps the first. Apply a colour fill to the second rectangle. With the second rectangle selected, click Weld and with the arrow cursor that appears click on the first rectangle. You will find the two rectangles have combined into a single object **without a fill.**

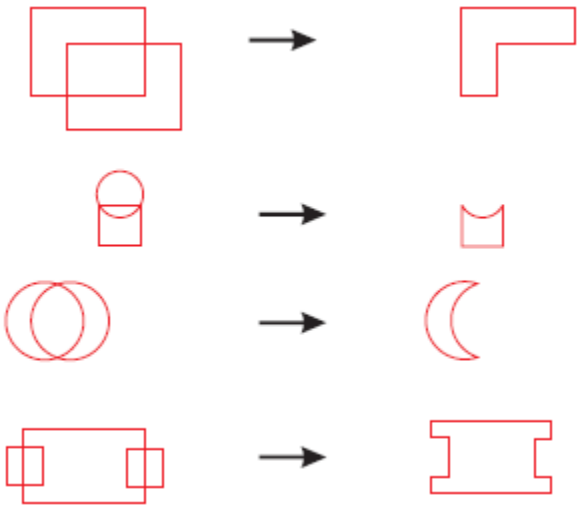
Try this again, this time selecting the first object and welding this to the second. You will achieve the same shape but **this time the new object has a fill**.



The Trim Command

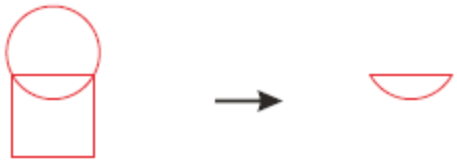
The Trim command creates a single curve from 2 or more components. The components must overlap. Trim forms the shape of the selected object (Source Object) into the object you trim to where it overlaps. (Target Object).

You are given the option to leave the original Source object and/or Target object. Checking these tick-boxes will create duplicate originals. This is useful for advanced users with good planning skills and enables better productivity. It is advised that you leave these tick-boxes unchecked until you are fluent with using the Shaping tools. The Source Object is the object you originally select to weld or trim. The Target Object is the object you subsequently act upon.
It is important to understand that using these tools will affect the properties of the objects you are working with. The source object will take on the properties of the target object. The best way to understand how these tools are used is by example.
Draw a rectangle. Now draw a second rectangle that overlaps the first. With the second rectangle selected, click Trim and with the arrow cursor that appears click on the first rectangle.

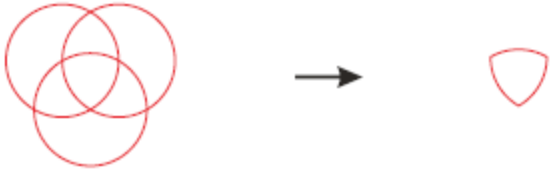


The Intersect Command
Intersect creates the shape that is formed by the overlap of 2 components.
You are given the option to leave the original Source object and/or Target object. Checking these tick-boxes will create duplicate originals.
Draw a rectangle. Now draw a second rectangle that overlaps the first. With the second rectangle selected, click Intersect With and with the arrow cursor that appears click on the first rectangle.

Try intersecting circles with squares



In this example I have Intersected one circle with another then intersected this with the third.



Features in CorelDraw environment

1. Menu bar: This allows to access most of the commands and features available in the software. The area containing pull-down menu options such as File, Edit, View etc.
2. Toolbox or toolbar: This contains different tools that will allow you to create and/or edit images.
3. Palettes: There are various type of palettes available in a graphic package. These palettes allow you to observe, organize and modify images. A dockable bar that contains colour switches.
4. Rulers: Horizontal and vertical boarders that are used to determine the size and position of objects in a drawing.
5. Title bar: this displays the title of currently open drawing.
6. Drawing window: The area outside the drawing page bordered by the scroll bars and application controls.
7. Docker: A window containing available commands and settings relevant to a specific tool or task.
8. Property bar: A detachable bar with commands that relate.

Shortcuts

Many of you will be familiar with Windows shortcut keys. CorelDRAW supports all the usual shortcuts and has a number of its own to speed up production. You can also assign your own shortcuts to suit your particular working methods. The common shortcuts you are likely to find useful with producing drawings for your laser cutter are listed below. As you become familiar with the program you are likely to use it for other purposes. A comprehensive list of
CorelDRAW shortcuts can be found in Tools Customisation Commands Shortcut Keys View All. You can save these to a comma separated text file or print them out.

Ctrl + Z	Undo
Shift + Ctrl + Z	Redo
Ctrl + C	Copy
Ctrl + V	Paste
Ctrl + X	Cut
Ctrl + G	Group
Ctrl + U	Ungroup
Shift + PgDn	To Back
Shift + PgUp	To Front
B	Align Bottom
E	Horizontally aligns centres
C	Verically aligns centre
L	Aligns left
R	Aligns right
P	Aligns to centre of page
Ctrl + L	Combine
Ctrl + K	Break apart
↑	Moves selection up by defined nudge
↓	Moves selection down by defined nudge
←	Moves selection left by defined nudge
→	Moves selection right by defined nudge

LESSON EIGHT

HIGH LEVEL LANGUAGE

A programming language is an artificial language that can be used to control the behaviour of a machine, particularly a computer.

A high-level programming language that in comparison to low-level programming language, may be more abstract, easier to use, or more portable across platforms.

Examples:

i. COBOL – Business application
ii. FORTRAN – Engineering and scientific Application
iii. PASCAL – General use and as a teaching tool

iv. C & C++ – General purpose-currently most popular
v. PROLOG – Artificial intelligence
vi. JAVA – General purpose-gaining popularity rapidly

High Level languages are sometimes divided into 3 categories, namely: Third generation, fourth generation and fifth generation.
(i) THIRD GENERATION PROGRAMMING LANGUAGE (3GL)
3GL is a programming language designed to be easier for human to understand. Examples are BASIC, C, C++, JAVA, COBOL, FORTRAN, ALGOL.
(ii) FOURTH-GENERATION PROGRAMMING LANGUAGE (4GL)
4GL is a programming language designed with a specific purpose in mind, such as the development of commercial business software. All 4GLs are designed to reduce programming effort, the time it takes to develop software, and the cost of software development.
Examples are: SQL, Oracle Reports, Postscript, Informix-4GL, Borland Delphi.
(iii)FIFTH-GENERATION PROGRAMMING LANGUAGE (5GL)
This languages are used mainly in artificial intelligence research. Examples are prolog, OPSS and Mercury.

VERY HIGH-LEVEL PROGRAMMING LANGUAGE
This is a programming language with a very high level of abstraction, used primarily as a professional programmer productivity tool. Example is Logo.
QUERY LANGUAGE: These languages are used to make queries into databases and information systems. Examples are SQL, MDL.
High Level languages can be categorized based on their uses. These are:

a. Scientific Algebraic Formula – Type processing
   Examples are: BASIC (Beginners All-purpose Symbolic Instruction code)
   FORTRAN (Formula Translation)
   ALGOL (Algorithmic Language)
   APL (A Programming Language)

b. Business Data processing
   Examples are: COBOL (Common Business Oriented Language)
   RPG (Report Program Generator)
c. Artificial Intelligence (AI) string and list processing
   LISP (List Processing)
   PROLOG (Program in Logic)
d. Object Oriented Programming Language
   Examples are: C++, JAVA
e. Special Purpose Programming Language
   Examples are: SNOBOL (String-oriented Symbolic Language)
f. General purpose Programming Language
   Examples are: C, PASCAL, PL/I (Programming Language, version 1)
g. Visual Programming Language: These are designed for building windows-based applications.
   Examples are: visual BASIC, visual JAVA, visual C.

Models Of execution
There are three models of execution for modern high-level languages: Interpreted, Compiled and Translated.
INTERPRETED: These languages are read and then executed directly, with no compilation stage. Examples are: BASIC, ASP, LISP and LOGO.

COMPILED: These languages are transformed into an executable form before running.
Examples are: PASCAL, COBOL, C and FORTRAN
TRANSLATED: Example is C programming Language.

Advantages of High Level Language

1. It is user-friendly
2. Similar to English with vocabulary of words and symbols
3. It is easier to learn
4. They require less time to write
5. They are easier to maintain
6. It is independent of the machine on which it is used

Disadvantages of high level language

1. A high-level language has to be translated into the machine language by a translator and thus a price in computer time is paid.
2. The object code generated by a translator might be in efficient compared to an equivalent assembly program.

Tutorial questions

1. State the type of translator necessary for a program written in
   (i) High level language
   (ii) Assembly level language
2. List any two high level programming language
3. Define Computer Programming language
4. State any two disadvantages between high level and low level languages and give an example of each.

LESSON NINE

OVERVIEW OF NUMBER BASES

Numeral system is a collection of symbols used to represent small numbers, together with a system of rules for representing larger numbers. The four numbering system commonly used with micro computers are the binary, octal, decimal and hexadecimal.

a. Binary numbering system: it uses only 2 digits, zero (0) and one (1)
b. Octal numbering system: it uses a radix of 8. It is a base 8 system. The digits in octal numbering system are: 0,1,2,3,4,5,6,7
c. Decimal numbering system: it uses 10 digits. It is called base 10 numbering system. The digits involved are 0,1,2,3,4,5,6,7,8,9.
d. The Hexadecimal numbering system: it uses 16 digits and it is called base 16 numbering system. The digits involved are 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F. A,B,C,D,E,F represent the natural numbers 10,11,12,13,14,15 respectively.

Hexadecimal	0	1	2	3	4	5	6	7	8	9	A	B	C	D
Decimal Equivalent	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Binary equivalent	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101
Octal equivalent	0	1	2	3	4	5	6	7	001	011	012	013	014	015

Conversion of number system

To convert numbers in base 2, 8 and 16 to numbers in base 8, 16 and 2, the first step is to convert the given numbers to base 10, the second step is to convert the base 10 number to numbers in the required base.

Conversion of numbers in bases 2 to number in base 10

Example 1: convert 1101_2 to base 10

1 1 0 1

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

$=1x2^3 + 1x2^2 + 0x2^1 + 1x2^0$

$= 8 + 4 + 0 + 1 = 13_{10}$

Example 2: covert 1110.110_2 to base 10

1 1 1 0 1 1 0

2^3 2^2 2^1 2^0 2^{-1} 2^{-2} 2^{-3}

$= 1x2^3 + 1x2^2 + 1x2^1 + 0x2^0 + 1x\frac{1}{2^1} + 1x\frac{1}{2^2} + 0x\frac{1}{2^3}$

$=8 + 4 + 2 + 0 + \frac{1}{2} + \frac{1}{4} + 0$

$=8 + 4 + 2 + 0 + 0.5 + 0.25 = 14.75_{10}$

<u>Conversion of numbers in base 8 to numbers in base 10</u>

Convert 327 to base 10

3 2 7

8^2 8^1 8^0

$= 3x8^2 + 2x8^1 + 7x8^0 = 192+16+7$

$=215_{10}$

<u>Conversion of numbers in base 16 to number in base 10</u>

Example 1: convert 5B to base 10

5 B

16^1 16^0

$= (5x16^1) + (Bx16^0) = (5x16) + (11x1)$

$= 80 + 11 = 91_{10}$

Example 2: Convert A4F to base 10

A 4 F

16^2 16^1 16^0

$= (Ax16^2) + (4x16^1) + (Fx16^0)$

$= 10x256 + 4x16 + 15x1 = 2560 + 64 + 15$

$= 2639_{10}$

<u>Conversion of numbers in base 10 to numbers in base 2, 8 and 16</u>

Example 1: Convert 13 to base 2

2	13	Remainder
2	6	1
2	3	0
2	1	1
	0	1

Least significant digit (LSD)

Most significant digit (MSD)

The answer is written starting from MSD to LSD

The answer is 1101_2

Example 2: Convert 215 to number in base 8

8	215	Remainder
8	26	7
8	3	2
	0	3

Least significant digit (LSD)

Most significant digit (MSD)

$=327_8$

Example 3: Convert 91 to number in base 16

16	91	Remainder
16	5	11 (B)
	0	5

Answer is $5B_{Hex}$

Example 4: Convert 272.45 to base 2

2	272	Remainder
2	136	0
2	68	0
2	34	0
2	17	0
2	8	1
2	4	0
2	2	0
2	1	0
	0	1

Least significant digit (LSD)

Most significant digit (MSD)

$272 = 100010000_2$

.	45x2
0	90x2
1	80x2
1	60x2
1	20x2
0	40x2
0	80x2
1	60

$0.45_{10} = 0.0111001_2$

Therefore $272.45_{10} = 100010000.0111001_2$

Base Addition

15 + 7

$$\begin{array}{cc} 1 & 5 \\ + & 7 \\ \hline 2 & 2 \\ \hline \end{array}$$

$101 + 010_2$

$$\begin{array}{cccc} & 1 & 0 & 1_2 \text{ Augend} \\ + & 0 & 1 & 0_2 \text{ Addend} \\ \hline & 1 & 1 & 1_2 \text{ sum} \\ \hline \end{array}$$

$101 + 101_2$

	1	0	1_2
+	1	0	1_2
1	0	1	0_2

	4	5	6_8
+ 1		2	3_8
	6	0	1_8
	4	5	6_{16}
+	7	8	4_{16}
	B	D	A_{16}

7	8	4_{16}	
+	B	D	A_{16}
1	3	5	E_{16}

Base Subtraction

1	0	1	1	0_2
-	1	1	0	0_2
	1	0	1	0_2

4	0_8	
-	7_8	
3	1_8	

7	E	5	E_{16}
-	4	7	1_{16}
4	7	1	A_{16}

7	E	9	C	4_{16}
-	F	4	A	1_{16}
6	F	5	2	3_{HEX}

Tutorial Questions

1. Convert $D5FA_{16}$ to binary
2. Convert 245.24_{10} to binary
3. Convert 1011011_2 to hexadecimal equivalent
4. Convert 110011.101_2 to decimal
5. Convert 2BC in hexadecimal to decimal number
6. Convert the following numbers to the stated bases:
   (a) 125.625_{10} to binary
   (b) 111011.10011_2 to octal

7. Evaluate the following in octal base system:
(i) $432_8 + 765_8$
(ii) $2146_8 + 43_8$

LESSON TEN
DATA REPRESENTATION

Data representation refers to the methods used internally to represent information stored in a computer. Computers stored a lot of different types of information such as (a) Numbers (b) Text (c) Graphics (still, video, animation) (d) sound

Methods of data representation

1. Binary Coded Decimal (BCD): This is also called 8421 weighted code because each digit is encoded using four binary columns.
   Each digit is coded into binary as follows:
   4 = 0100 5 = 0110 8 = 1000 1 = 001
   Therefore 4581_{10} will be: 0100011010000001_2
2. American Standard and Code for Information Interchange (ASCII): This is a seven bit code which was jointly developed by many computer manufacturers
3. Extended Binary Coded Decimal Interchange Code (EBCDIC): This is an eight-bit code which can be used to represent decimal digits 0 to 9 in upper case and lower case letters and additional characters.
4. Bits
5. Nibble
6. Bytes

Character	7-bit ASCII	EBCDIC
0	0110000	11110000
1	0110001	11110001
2	0110010	11110010
3	0110011	11110011
4	0110100	11110100
5	0110101	11110101
6	0110110	11110110
7	0110111	11110111
8	0111000	11111000
9	0111001	11111001
A	1000001	11000001
B	1000010	11000010
C	1000011	11000011
D	1000100	11000100
E	1000101	11000101
F	1000110	11000110
G	1000111	11000111
H	1001000	11001000
I	1001001	11001001
J	1001010	11001010

Tutorial Questions

1. Give the meaning of the following coding system
(i) ASCII
(ii) BCD

2. Write short notes on any two of the following data representation:
   (i) Binary Coded Decimal
   (ii) Extended Binary Coded Decimal Interchange Code
   (iii) American Standard Code for Information Interchange
   (iv) Excess-3 code
   (v) Gray code
3. Use BCD digits equivalent to convert 1011011_2 to its hexadecimal equivalent.

BASIC PROGRAMMING III (One dimensional array)

Array variable is a collection of simple variables of the same type to which the computer can efficiently assign a list of values. Arrays are useful for organizing multiple variables. To create an array, use the DIM(dimension) command.

If array-Name is the name of an array variable and n is an integer, then the statement

DIM arrayNamed(n)

For example, if an array is called X and there are 6 components, the components are X(1), X(2), X(3), X(4), X(5), X(6)

Reserves space in memory to hold the values of the subscripted variables arrayName(1), arrayName(2), arrayName(3), … , arrayName(n)

Values can be assigned to subscripted variables with LET statement and displayed with PRINT statements.

```
10 DIM score (5)
20 LET score(1)=50
30 LET score(2)=70
40 LET score(3)= 90
50 LET score(4)= 80
60 LET score(5)=20
```

score (1)	score(2)	score(3)	score(4)	score(5)
50	70	90	80	20

Example 1: calculate the average of one dimensional array with 100 numeric values

```
10 REM calculate average of 100 numbers
20 DIM (100)
30 LET TOT=0
40 FOR I = 1 TO 100
50 INPUT "Enter the number "; IN(I)
60 LET TOT = TOT + IN(I)
70 NEXT I
80 AVG = TOT/100
90 PRINT " The average of 100 numbers is "; AVG
100 END
```

Example 2: Calculate the area of 10 different rectangles

```
10 REM   Calculate the area of 10 different rectangles
20 DIM LEN(10), WID (10), AREA(I)
30 LET I=1
40 WHILE I<11
50 INPUT "Enter Length of rectangle "; LEN(I)
60 INPUT "Enter Width of rectangle "; WID(I)
70 AREA(I) = LEN(I) * WID(I)
80 PRINT "The area of the rectangle is "; AREA(I)
90 I=I+1
100 WEND
101 END
```

Looping/ Iteration / Repetition

Loops are repeated execution of one or more lines in a program. BASIC provides three categories of looping statements:

(i) FOR … NEXT loops,

Syntax: FOR (logical expression)
<executable statement>
NEXT <variable>

(ii) WHILE … WEND loops

Syntax: WHILE (logical expression)
<executable statement>
WEND

(iii) DO … UNTIL loops

SYNTAX: DO
<executable statement>
LOOP UNTIL <logical expression>

These looping statements allow one or more lines in a program to be executed a number of times.

Making decision in BASIC

Use the following statements

(i) IF … THEN
(syntax: IF (logical expression) THEN (executable statement))

(ii) SELECT … CASE

Syntax: SELECT CASE (case selector)
CASE value1 <executable statement>
CASE value2 <executable statement>
CASE ELSE <executable statement>
END SELECT

Tutorial Questions

1. Write a BASIC program to calculate the perimeter of a circle
2. State the function of the following BASIC statements
   LET
   REM
   INPUT
3. Define looping as regards to computer language