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**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 22.02.2021**

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| **Topic of Lecture:** Introduction to Networks |
| **Introduction :**   * A Network: A group of devices that can communicate with each other over links. * Each device is called a host. * Each host has a unique address. * Network is a connection between two or more devices. * Which is connected by a communication links. |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Computer * Telecommunication * Data * Information * Internet |
| **Detailed content of the Lecture:**  Network is a connection between two or more devices.Which is connected by a communication links.  A node can be computer, printer or any other devices which is capable of sending and receiving information at each other.  network  **Example:**  c15f01  An internet: A network of networks or connection between two or more Networks is also known as internet. each host has an address of the form n/h where n is the network number and h is the number of the host on network n.  network network  **Uses of Networks :**  It is Used for   * Business Application * Home Application * Mobile Users * E-Mail   **Point - to - Point Connection :**  It Provides a dedicated links between two devices.  For example, a wired system that connects two computers together can be thought of a point-to-point link.  **Multi - Point Connection :** It is a link between two or more devices. It is also known as Multi-Point configuration. The networks having multipoint configuration are called Broadcast Networks.  **1) Client -** Which gives the Request.  **2) Server -** Which gives the Response.  **3) Modems -** It Indicates Modulator / Demodulator.  **4) Router -** Which identifies the Path between Client & Server.  **5) Channels -** Which overcomes the Traffic problems. |
| **Video Content / Details of website for further learning (if any):**  https://cs.lmu.edu/~ray/notes/netsandinets |
| **Important Books/Journals for further learning including the page nos.:**  **Book:** Data Communication and Networking - Forouzan, Fifth Edition, TMH 2012**(PageNo : 4 - 7)** |

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**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 23.02.2021**

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| **Topic of Lecture:** Categories ofNetworks |
| **Introduction :**   * Networksaredividedintotwomaincategories: * Localareanetworks(LANs)andWideareanetworks(WANs). * Thesetwotypesofnetworkshavedifferentcharacteristicsanddifferentfunctionalities. * TheInternetisacollectionofLANsandWANsheldtogetherbyinternetworkingdevices. |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Client * Server * Telecommunication * Data * Information |
| **Detailed content of the Lecture:**  **CategoriesofNetworks:**   * Networks are generally referring to two primary categories: local-area networks and wide e-areanetworks. A LAN normally covers an area less than 2 Meters.AWANcanbe worldwide. * Networks of a size in between are normally referred to as metropolitan area networks andspantens ofmiles.   **a.LocalAreaNetwork:**   * Alocalareanetwork(LAN)isusuallyprivatelyownedandlinksthedevicesinasingle office, building, or campus.   Depending on the needs of an organization and the type of technology used, a LAN can be as simple as two PCs and a printer in someone's home office; or it can extend throughout a company and include audio and video peripherals.  Currently,LANsizeislimitedtoafewkilometers. |
| P145C4T4#yIS1  **b.WideAreaNetwork**  A wide area network (WAN) provides long-distance transmission of data, image, audio andvideo information over large geographic areas that may comprise a country, a continent or eventhe whole world.  A WAN can be as complex as the backbones that connect the Internet or assimple as a dial-up line that connects a home computer to the Internet.  We normally refer to thefirstas aswitched WANandto thesecond asa point-to-pointWAN  **c.MetropolitanAreaNetworks:**  Ametropolitanareanetwork(MAN)isanetworkwithasizebetweenaLANanda WAN. It normally covers the area inside a town or a city.  It is designed for customers who needa high-speed connectivity, normally to the Internet, and have endpoints spread over a city or partof city.  P159C4T4#yIS1 |
| **Video Content / Details of website for further learning (if any):**  https://[www.tutorialspoint.com/data\_communication\_computer\_network/computer\_network\_types.htm](http://www.tutorialspoint.com/data_communication_computer_network/computer_network_types.htm) |
| **Important Books/Journals for further learning including the page nos.:**  **Book:** Data Communication and Networking - Forouzan, Fifth Edition, TMH 2012**(PageNo : 30 -33)** |

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**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 24.02.2021**

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| **Topic of Lecture:** CommunicationModel |
| **Introduction :**   * Networksaredividedintotwomaincategories: * Localareanetworks(LANs)andWideareanetworks(WANs). * Thesetwotypesofnetworkshavedifferentcharacteristicsanddifferentfunctionalities. * TheInternetisacollectionofLANsandWANsheldtogetherbyinternetworkingdevices |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Computer * Telecommunication * Data * Information * Internet |
| **Detailed content of the Lecture:**  **Data communications** are the exchange of data between two devices via some form oftransmissionmedium such as a wirecable.  **Characteristics:**   * The effectiveness of a data communications system depends on four fundamentalcharacteristics:   **Delivery:**   * The system must deliver data to the correct destination. Data must be received by theintendeddevice or userand only bythatdevice or user.   **Accuracy:**   * Thesystemmustdeliverdataaccurately.   **Timeliness**:   * The system must deliver data in a timely manner. In the case of video and audio, timelydelivery means delivering the data as they are produced. In the same order, that they areproduced,andwithoutsignificantdelay.Thiskindofdeliveryiscalledreal-timetransmission.   **Jitter:**   * Jitter refers to the variation in the packet arrival time. It is the uneven delay in thedeliveryof audio or video packet. |
| **Components:**  Adatacommunicationsystemhasfivecomponents.   1. **Message**:   The message is the information to be communicated. Popular forms of informationincludetext,numbers, picturesaudioand video.   1. **Sender**:   The sender is the device that sends the data message. It can be a computer, workstation,telephonehandset, videocamera, andso on.   1. **Receiver:**   The receiver is the device that receives the message. It can be a computer, workstation,telephonehandset, television and soon.   1. **Transmissionmedium:**   The transmission medium is the physical path by which a message travels from sender toreceiver.Ex.Twistedpairwire,coaxial cable,fiberopticcableandradiowaves.   1. **Protocol:**   A protocol is the set of rules that governs data communications. It represents anagreementbetween thecommunicating devices.  P77C4T2#yIS1  P79C4T2#yIS1 |
| **Video Content / Details of website for further learning (if any):**  https://[www.tutorialspoint.com/data\_communication\_computer\_network/index.htm](http://www.tutorialspoint.com/data_communication_computer_network/index.htm) |
| **Important Books/Journals for further learning including the page nos.:**  **Book:** Data Communication and Networking -Forouzan, Fifth Edition, TMH 2012**(PageNo : 2 - 4)** |

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**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 25.02.2021**

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| **Topic of Lecture:** DataTransmissionConcepts andTerminology |
| **Introduction :**   * It refers to the direction of information flow between two devices. * Transmission media may be classified as guided or unguided. * Communication is in the form of electromagnetic waves. * The waves are guided along a physical path; examples of guided media are twisted pair, coaxial cable, and optical fiber. * Data Transmission occurs between Sender and Receiver over some Transmission Medium. |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Medium * Data communication * Message * Information * Network * Network |
| **Detailed content of the Lecture:**  **Data Transmission** are the exchange of data between two devices via some form oftransmissionmedium such as a wirecable.  **Characteristics:**   * The effectiveness of a data communications system depends on four fundamentalcharacteristics:   **Delivery:**   * The system must deliver data to the correct destination. Data must be received by theintendeddevice or userand only bythatdevice or user.   **Accuracy:**   * Thesystemmustdeliverdataaccurately.   **Timeliness**:   * The system must deliver data in a timely manner. In the case of video and audio, timelydelivery means delivering the data as they are produced. In the same order, that they areproduced,andwithoutsignificantdelay.Thiskindofdeliveryiscalledreal-timetransmission.   **Jitter:**   * Jitter refers to the variation in the packet arrival time. It is the uneven delay in thedeliveryof audio or video packet. |
| **Transmission Media may be classified into Two Types :**  **i) Guided Media [Wired Technology]**  **ii) Unguided Media [Wireless Technology]**  **i) Guided Media (Wired Network)**  In Guided Media Signals are Passed in a “ same physical path”  **Example:**  i) Twisted pair Cable  ii) Coaxial Cable  iii) Fiber Optic Cable  **ii) Unguided Media (Wireless Network)**  In Unguided Media Signals are Passed in the form of “ Electromagnetic Waves”  **Example :**  i) Mobile phones  ii) Satellite microwave  iii) Infrared  **Point - to - Point Connection :** It Provides a dedicated links between two devices.  For example, a wired system that connects two computers together can be thought of a point-to-point link.  point-to-point_G5hllNX  **Multi - Point Connection :** It is a link between two or more devices. It is also known as Multi-Point configuration. The networks having multipoint configuration are called Broadcast Networks.  download |
| **Video Content / Details of website for further learning (if any):**  https://[www.tutorialspoint.com/data\_communication\_computer\_network/index.htm](http://www.tutorialspoint.com/data_communication_computer_network/index.htm) |
| **Important Books/Journals for further learning including the page nos.:**  **Book:** Data Communication and Networking -Forouzan, Fifth Edition, TMH 2012**(PageNo : 21 - 22)** |

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**LECTURE HANDOUTS**

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**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 26.02.2021**

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| **Topic of Lecture:** ProtocolArchitecture |
| **Introduction :**   * It is a layered structure of H/W and S/W that supports exchange ofdata b/w systems * It supports distributed applications(E-Mail, File Transfer) * Each layer of protocol architecture provides some set of rules * it is model for understanding and designing a network architecture that is flexible, robust and interoperable. |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Data Transmission * Transmission Mode * Internet * Transmission Media |
| **Detailed content of the Lecture:**  **There are 2 widely used protocol architecture**   * **TCP/IP Architecture** * **OSI Model**   Protocol is a set of rules that govern data communication  It represents what is communicated, when it is communicated and how it is communicated.  There are 3 key elements   * **Syntax** * **Semantics** * **Timing**   **Syntax :** It represents structure, Format of data the order in which it is presented  Data may contain:  **First 8 bit -> Sender Address**  **Second 8 bit -> Receiver Address**  **Remaining bits-> message stream** |
| **Semantics :** It refers the meaning of each section of bit  **Timing** : It refers when data sent and how fast it is sent (Says Characteristics)  **Ex:100Mbps**  **Protocol Standards :**  It provides model for the development of product regardless of individual manufacturer  It falls in 2 categories   * **De Facto standard**   Not officially adopted but used widespread  It has 2 categories  Proprietary->Wholly owned by company  Non-Proprietary->Group or communiy developed for public   * **De Jure Standard**   A Standard Legislated by an officially recognized body  **Standard Organizations:**   * **International Standard Organization** * **ANSI** * **IEEE** |
| **Video Content / Details of website for further learning (if any):**  https://webstor.srmist.edu.in/web\_assets/srm\_mainsite/files/files/Protocols%20and%20Architecture.pdf |
| **Important Books/Journals for further learning including the page nos.:**  **Book:** Data Communication and Networking -Forouzan, Fifth Edition, TMH 2012**(PageNo : 7 - 9)** |

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**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 01.03.2021**

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| **Topicof Lecture:**OSIModel |
| **Introduction:**   * Computer networks are created by different entities. Standards are needed so that theseheterogeneous networks can communicate with one another. The two best-known standards aretheOSI model and the Internet model. * TheOSI(OpenSystemsInterconnection)modeldefinesaseven-layernetwork. |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Computer * NetworkModels * NetworkCommunication * Topology * Internet |
| **Detailedcontent oftheLecture:**  **LayersintheOSIModel:**  P293C4T8#yIS1  **PhysicalLayer**   * The physical layer coordinates the functions required to carry a bit stream over a physicalmedium. It deals with the mechanical and electrical specifications of the interface andtransmissionmedium. |

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| **DataLinkLayer**   * Thedatalinklayertransformsthephysicallayer,arawtransmissionfacility,toareliable link. * **Thedatalinklayerisresponsibleformovingframesfromonehop(node)tothenext.**   **NetworkLayer:**  The network layer is responsible for the source-to-destination delivery of a packet,possiblyacross multiplenetworks (links).  **The network layer is responsible for the delivery of individual packets from the sourcehostto thedestinationhost.**  **Transportlayer:**   * The transport layer is responsible for process-to-process delivery of the entire message. Aprocessisanapplicationprogramrunningonahost. * Thetransportlayerensuresthatthewhole message arrives intact and in order, overseeing both error control and flow control at the source to-destinationlevel. * **The transport layer is responsible for the delivery of a message from one process toanother.**   **SessionLayer:**  The session layer is the network dialog controller. It establishes, maintains, andsynchronizesthe interaction amongcommunicating systems.  **Thesessionlayerisresponsiblefordialogcontrolandsynchronization.**  **PresentationLayer:**   * The presentation layer is concerned with the syntax and semantics of the informationexchangedbetween twosystems. * **Thepresentationlayerisresponsiblefortranslation,compression,andencryption.**   **ApplicationLayer:**   * Theapplicationlayerenablestheuser,whetherhumanorsoftware,toaccessthenetwork. * It provides user interfaces and support for services such as electronic mail, remote file access andtransfer,shareddatabasemanagement,and othertypesofdistributedinformation services. * **Theapplicationlayerisresponsibleforprovidingservicestotheuser.** |
| **VideoContent/Detailsofwebsiteforfurtherlearning(ifany):**  <https://www.tutorialspoint.com/data_communication_computer_network/> physical\_layer\_introduction.htm |
| **ImportantBooks/Journalsforfurtherlearningincludingthepagenos.:**  **Book:** Data Communication and Networking -Forouzan, Fifth Edition, TMH 2012**(PageNo : 43 - 55)** |

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**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 02.03.2021**

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| **Topicof Lecture:**TCP/IP |
| **Introduction:**   * The TCP/IP protocol suite was developed prior to the OSI model. Therefore, the layers intheTCP/IPprotocol suitedo not exactlymatchthose intheOSI model. * The original TCP/IP protocol suite was defined as having four layers: host-to-network,internet,transport, and application. |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Computer * NetworkModels * NetworkCommunication * Topology * OSI Model |
| **Detailedcontent oftheLecture:**  **TCP/IPPROTOCOL**  P396C4T10#yIS1 |
| The TCP/IP protocol suite is made of five layers: physical, data link, network, transport,andapplication.Thefirstfourlayersprovidephysicalstandards,networkinterfaces,  Inter-networking, and transport functions that correspond to the first four layers of the OSI model.The three topmost layers in the OSI model, however, are represented in TCP/IP by a single layercalledthe applicationlayer  **PhysicalandDataLinkLayers**:   * Atthephysicalanddatalinklayers,TCP/IPdoesnotdefineany specificprotocol. * It supports all the standard and proprietary protocols. A network in a TCP/IP internetwork can be alocal-areanetwork or awide-area network.   **NetworkLayer:**   * At the network layer (or, more accurately, the internetwork layer), TCP/IP supports theInternetworking Protocol. IP, in turn, uses four supporting protocols: ARP, RARP, ICMP, andIGMP.   **TransportLayer:**   * TraditionallythetransportlayerwasrepresentedinTCP/IPbytwoprotocols: * TCPand UDP. IP is a host-to-host protocol, meaning that it can deliver a packet from one physical deviceto another. UDP and TCP are transport level protocols responsible for delivery of a messagefrom a process (running program) to another process. A new transport layer protocol, SCTP, hasbeendevised to meet the needs of somenewer applications.  1. **UserDatagramProtocol**  * The User Datagram Protocol (UDP) is the simpler of the two standard TCP/IP transportprotocols. It is a process-to-process protocol that adds only port addresses, checksum errorcontrol,andlengthinformation to thedatafromthe upper layer.  1. **TransmissionControlProtocol**  * TheTransmissionControlProtocol(TCP)providesfulltransport-layerservicesto applications. * TCP is a reliable stream transport protocol. The term stream, in this context, meansconnection-oriented: A connection must be established between both ends of a transmissionbeforeeithercantransmit data.  1. **StreamControlTransmissionProtocol**  * The Stream Control Transmission Protocol (SCTP) provides support for newer applicationssuch as voice over the Internet. It is a transport layer protocol that combines the best features ofUDPand TCP. |
| **VideoContent/Detailsofwebsiteforfurtherlearning(ifany):**  <https://www.javatpoint.com/computer-network-tcp-ip-model> |
| **ImportantBooks/Journalsforfurtherlearningincludingthepagenos.:**  **Book:** Data Communication and Networking -Forouzan, Fifth Edition, TMH 2012**(PageNo : 56 - 57)** |

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**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 03.03.2021**

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| **Topic of Lecture:** LANTopology |
| **Introduction :**   * Protocols refer to the rules; a standard is a protocol that has been adopted by vendors andmanufacturers. Network models serve to organize, unify, and control the hardware and softwarecomponentsof datacommunicationsand networking. |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Computer * Telecommunication * DataCommunication * Message * Internet   Internet |
| **Detailed content of the Lecture:**  **PhysicalTopology:**   * The term physical topology refers to the way in which a network is laid out physically. Two ormore devices connect to a link; two or more links form a topology. The topology of a network isthe geometric representation of the relationship of all the links and linking devices (usuallycallednodes) to one another. * Therearefourbasictopologiespossible:mesh,star,bus, andring   P217C4T6#yIS1  **Mesh Topology**   * In a mesh topology, every device has a dedicated point-to-point link to every otherdevice.Afullyconnected meshnetworkwithn nodeshasn(n-1)/2physicalchannels. * To accommodate that many links, every device on the network must have n – 1 input/output(I/O)ports tobe connectedto theothern – 1stations. |
| **Star Topology**:   * In a star topology, each device has a dedicated point-to-point link only to acentral controller, usually called a hub. * The devices are not directly linked to one another. Unlikea mesh topology, A star topology does not allow direct traffic between devices. The controlleracts as an exchange: If one device wants to send data to another, it sends the data to thecontroller,which thenrelays the datato the otherconnected device.   **BusTopology**:   * Abustopologyismultipoint.Onelongcableactsasabackbonetolinkall the devices in a network (see Figure 1.7). Nodes are connected to the bus cable by drop lines andtaps.   P233C4T6#yIS1  **RingTopology:**   * Inaringtopology,eachdevicehasadedicatedpoint-to-pointconnectionwith only the two devices on either side of it. A signal is passed along the ring in one direction,from device to device, until it reaches its destination. Each device in the ring incorporates arepeater.   P238C4T6#yIS1  **Hybrid Topology:** A network can be hybrid. For example, we can have a main star topologywitheach branch connecting severalstationsinabus topology  P242C4T6#yIS1 |
| **Video Content / Details of website for further learning (if any):**  <https://www.tutorialspoint.com/data_communication_computer_network/computer_network_> topologies.htm |
| **Important Books/Journals for further learning including the page nos.:**  **Book:** Data Communication and Networking -Forouzan, Fifth Edition, TMH 2012**(PageNo : 22 - 28)** |

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**LECTURE HANDOUTS**

**I / II**

**MCA**

**Course Name with Code : Data Communication And Networks / 19CAB09**

**Course Faculty : Mr. S.Nithyananth**

**Unit : I - Network Fundamentals**

**Date of Lecture: 04.03.2021**

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| **Topic of Lecture:** Transmission Media |
| **Introduction :**   * Transmission media are actually located below the physical layer and are directly controlledbythe physical layer. * A transmission medium can be broadly defined as anything that can carry informationfromasource to a destination. |
| **Prerequisite knowledge for Complete understanding and learning of Topic:**   * Computer * NetworkModels * NetworkCommunication * Physical Medium |
| **Detailed content of the Lecture:**  **Transmissionmedia:**  P581C4T14#yIS1   * Intelecommunications,transmissionmediacanbedividedintotwobroadcategories: * guided and unguided. Guided media include twisted-pair cable, coaxial cable, and fiber-opticcable.Unguided mediumis free space.   P586C4T14#yIS1 |
| **Guidedmedia:**   * Guided media, which are those that provide a conduit from one device to another, include twisted-paircable, coaxial cable, and fiber-optic cable. * A signal traveling along any of these media is directed andcontained by the physical limits of the medium. Twisted-pair and coaxial cable use metallic (copper)conductors that accept and transport signals in the form of electric current. Optical fiber is a cable thatacceptsandtransports signals intheform of light.   **Twisted-PairCable**   * A twisted pair consists of two conductors (normally copper), each with its own plastic insulation,twistedtogether. * One of the wires is used to carry signals to the receiver, and the other is used only as a groundreference.   P595C4T14#yIS1  **Unguidedmedia:**  Unguided signals can travel from the source to destination in several ways: groundpropagation,sky propagation, andline-of-sight propagation  P745C4T18#yIS1  **RadioWaves:**  Electromagnetic waves ranging in frequencies between 3 kHz and 1 GHz are normally called radiowaves; waves ranging in frequencies between 1 and 300 GHz are called microwaves. Radio waves, forthemostpart,areomnidirectional.Whenanantennatransmitsradiowaves,theyarepropagatedinall directions.  **Microwaves**  Electromagnetic waves having frequencies between I and 300 GHz are called Microwaves.Microwaves are unidirectional. When an antenna transmits microwave waves, they can be narrowlyfocused.  **Infrared**:  Infrared waves, with frequencies from 300 GHz to 400 THz (wavelengths from 1 mm to 770 nm), canbe used for short-range communication. Infrared waves, having high frequencies, cannot penetratewalls. |
| **Video Content / Details of website for further learning (if any):**  https:[//w](http://www.javatpoint.com/transmission-media)ww[.javatpoint.com/transmission-media](http://www.javatpoint.com/transmission-media)  https://[www.javatpoint.com/unguided-transmission-media](http://www.javatpoint.com/unguided-transmission-media) |
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