


**Government of Karnataka**  
**Department of Technical Education**  
**Bengaluru**

	Course Title: <b>Computer Network</b>		
	Scheme (L:T:P) : <b>4:0:0</b>	Total Contact Hours: <b>52</b>	Course Code: <b>15CS34T</b>
	Type of Course: <b>Lectures, Self Study &amp; Student Activity.</b>	Credit : <b>04</b>	Core/ Elective: <b>Core</b>
CIE- 25 Marks		SEE- 100 Marks	

### Prerequisites

Basic Knowledge of Computers and Communication

### Course Objectives:

1. Discuss basic concepts, the need, and the various components in Networking
2. Learn the types of network topologies used in a network.
3. Discuss the importance of LAN components, protocols and addressing schemes.
4. Learn the basic concepts of WAN connectivity and its devices.

### Course Outcome

*On successful completion of the course, the students will be able to attain below Course Outcome (CO):*

Course outcome		CL	Linked PO	Teaching Hours
CO1	Define various data communication components in networking.	R, U	1,2,10	06
CO2	Describe networking with reference to different types of models and topologies.	R, U	1,2,10	06
CO3	Summarize the concepts related to error detection, correction and error control techniques.	R, U	2,3,4,5,10	08
CO4	Recognize the importance of LAN components, protocols that enable multiple computers to communicate with one another.	U, A	2,3,4,8,10	14
CO5	Identify the features of the different IP address classes.	R, A	2,3,4,10	06
CO6	Explain different connectivity and devices related to WAN.	U, A	2,3,4,5,8,10	12
		<b>Total sessions</b>		<b>52</b>

**Legends:** R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

## Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
<b>Computer Network</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	-	-	<b>2</b>	<b>3</b>	<b>3</b>

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If  $\geq 40\%$  of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If  $< 5\%$  of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

## Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks Weightage	Marks Weightage (%)
			R	U	A		
I	Introduction to Data Communication	06	05	11	-	16	11.53
II	Introduction to Networking and Topologies	06	-	08	08	16	11.53
III	Error Detection and Error Correction	08	-	13	10	23	15.38
IV	LAN Components and Protocols	14	-	15	25	40	27
V	Network Addressing	06	-	16	-	16	11.53
VI	Wide Area Networks	12	-	15	19	34	23.03
<b>Total</b>		<b>52</b>	<b>05</b>	<b>78</b>	<b>62</b>	<b>145</b>	<b>100</b>

### UNIT I: Introduction to Data Communication

06 Hrs

Data communication: Components, Data representation, Data flow, Networks – Categories of networks, Internetwork – Internet and Protocols, Analog and Digital Signals, Periodic and Non-Periodic Signals, Sine Wave, Phase, Wavelength, Digital Signals, Bit-rate, Bit-length, Transmission Impairment – Attenuation, Distortion and Noise, Performance - Bandwidth, Throughput, Latency, Jitter (Basic concepts only). Transmission Modes – Parallel and Serial Transmission, Asynchronous and Synchronous Transmission

### UNIT II: Introduction to Networking and Topologies

06 Hrs

Overview of Networking, Need for Networking, Hardware and Software components, Network Communication Standards, OSI Reference Model, TCP/IP Model, Overview of network topologies, Basic topologies- bus, ring, star, mesh and hybrid

### UNIT III: Error Detection and Correction

08 Hrs

Introduction, Types of Errors, Redundancy, Detection versus Correction, Forward Error Correction versus Retransmission, Coding, Block Coding, Error Detection, Error Correction, Cyclic Codes, Cyclic Redundancy Check, Polynomials, Advantages of Cyclic Codes, Flow Control, Error Control, Multiple Access - CSMA, CSMA/CD, Controlled Access – Reservation, Polling, Token Passing

**UNIT IV: LAN Components and Protocols****14Hrs**

LAN Cables – Co-axial, twisted pair, optical fibre, LAN connectors- co-axial cable, and twisted pair cable, optical fibre, LAN devices – repeaters, hubs, switches, NIC, WLANs.  
 Lower Layer Protocols - ARCnet, Ethernet, Ethernet Communication, Fast Ethernet, Gigabit Ethernet, Token Ring, Token Ring Frame format, Fault Management and tolerance, FDDI, Middle Layer Protocols- TCP/IP, Higher Layer Protocols- HTTP,FTP, SMTP, IMAP.

**UNIT V: Network Addressing****06 Hrs**

Introduction, TCP/IP addressing scheme- Components of IP addressing, IP address classes, Limitations of IP address classes, IP subnetting - Creating subnets in networks, Communication across subnets, Subnetting Considerations, Subnetting Limitations, IPv6.

**UNIT VI: Wide Area Networks****12 Hrs**

Overview, WAN Connectivity- POTS, Leased Lines, ISDN-Features and Working, VSAT-Devices, Networks, Architecture, Access Technologies, Microwave, Radio, Infrared, VPNs-Working of VPN, Protocols-PPTP,L2TP,IPSec.  
 WAN Devices – Bridges -Transparent and Source Routing, Routers –Routing Mechanics, Routing Table, Routing Protocols – RIP,OSPF, Gateways, WAN Protocols-PPP,X.25,FrameRelay and ATM ,Internet Tools and Services- Domain Name System , Windows Internet Naming Service, Dynamic Host Configuration Protocol.

**Text Books**

1. Data Communications and Networking - Behrouz A Forouzan, Tata McGraw-Hill, 5<sup>th</sup> edition, ISBN: 9780070634145 for **Unit I and III**.
2. Basics of Networking, PHI learning Pvt. Ltd. 2013, ISBN: 978-81-203-2489 for **Unit II, IV, V and VI**.

**References**

1. [http://www.tutorialspoint.com/data\\_communication\\_computer\\_network/index.htm](http://www.tutorialspoint.com/data_communication_computer_network/index.htm)
2. [http://www.e-tutes.com/lesson1/networking\\_fundamentals\\_lesson1\\_1.htm](http://www.e-tutes.com/lesson1/networking_fundamentals_lesson1_1.htm)
3. <http://www.techwarehouse.com/engine/d9e99072/Basic-Networking-Tutorial>
4. <http://www.nptel.com>
5. <http://www.w3schools.com/>

**Suggested list of student activities**

*Note: The following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)*  
 Student activity like mini-project, surveys, quizzes, etc. should be done in group of 3-5 students.

1. Each group should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned course co-ordinator and programme co-ordinator
2. Each group should conduct different activity and no repeating should occur.

1	Prepare a report on Significance of computer networks and its evolution specifying its advantages and disadvantages of computer networking
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2	Prepare a presentation on Sending Email via Telnet
3	Prepare a report on File sharing between computers using LAN connectivity
4	Prepare a report on Setting up a Wireless LAN
5	Prepare a report on Securing a Wireless LAN
6	Prepare a presentation on use of ping program to test your own computer

### Course Delivery

The course will be delivered through lectures and Power point presentations/ Video

### Course Assessment and Evaluation Scheme

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1 to 6
				Student activities	05	Activity Reports	1 to 6
				<b>Total</b>	<b>25</b>		
	SEE	End Exam		<b>End of the course</b>	<b>100</b>	Answer scripts at BTE	1 to 6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1 to 6 Effectiveness of Delivery of instructions & Assessment Methods

**Note:** I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

**Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:**

Sl. No	Bloom's Category	%
1	Remembrance	20
2	Understanding	45
3	Application	35

**Note to IA verifier: The following documents to be verified by CIE verifier at the end of semester**

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

## FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks			
Ex: I test/6 <sup>th</sup> week of sem 10-11 Am	I/II SEM		20			
	Year:					
Name of Course coordinator : CO's: _____			Units: __			
Question no	Question		MARKS	CL	CO	PO
1						
2						
3						
4						

**Note: Internal choice may be given in each CO at the same cognitive level (CL).**

## MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks			
Ex: I test/6 <sup>th</sup> week of sem 10-11 AM	III SEM	Computer Networks	20			
	Year: 2015-16	Course code:15CS34T				
Name of Course coordinator : Units:1,2 Co: 1,2			<b>Note: Answer all questions</b>			
Question no	Question		CL	CO	PO	
1	Define the following terms – (5) a. Data communication. b. Phase. c. Wavelength. d. Bandwidth. e. Throughput.		R	1	1,2	
2	Discuss different forms of data representation (5) OR Explain briefly the components of Data communication, with a diagram		U	1	1,2	
3	Explain the need for networking. (5)		A	2	1,2	
4	Explain TCP/IP reference model. (5)		U	2	1,2	

## Format for Student Activity Assessment

DIMENSION	Unsatisfactory 1	Developing 2	Satisfactory 3	Good 4	Exemplary 5	Score
<b>Collection of data</b>	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collects some basic information; refer to the topic	Collects relevant information; concerned to the topic	Collects a great deal of information; all refer to the topic	3
<b>Fulfill team's roles &amp; duties</b>	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs all duties	Performs all duties of assigned team roles with presentation	4
<b>Shares work equally</b>	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Does the assigned job without having to be reminded.	Always does the assigned work without having to be reminded and on given time frame	3
<b>Listen to other Team mates</b>	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Listens, but sometimes talk too much	Listens and contributes to the relevant topic	Listens and contributes precisely to the relevant topic and exhibit leadership qualities	3
<b>TOTAL</b>						<b>13/4=3.25=4</b>

*\*All student activities should be done in a group of 4-5 students with a team leader.*

**Diploma in Computer science & Engineering****III- Semester****Course Title: COMPUTER NETWORK**Time: **3 Hours**Max Marks: **100****PART-A****Answer any SIX questions. Each carries 5 marks.****5X6=30 Marks**

- 1) Define the following terms –
  - a. Data communication.
  - b. Phase.
  - c. Wavelength.
  - d. Bandwidth.
  - e. Throughput.
- 2) Explain the functions of physical and data link layers of OSI model.
- 3) Illustrate block coding with example.
- 4) Mention some standard CRC Polynomials.
- 5) Write a note on optical fibre cable.
- 6) Explain broadcasting in Ethernet network.
- 7) Discuss different subnetting considerations.
- 8) Describe the content of Routing table.
- 9) Explain the working of ISDN.

**PART-B****Answer any SEVEN full questions each carries 10 marks.****10X7=70 Marks**

1. Explain briefly the components of Data communication with diagram.
2. Explain OSI reference model with neat diagram.
3. Explain with an example design of CRC encoder and decoder.
4. List and explain coaxial twisted pair and optical fibre connectors.
5. Illustrate with diagram media access in Token Ring.
6. Compare SMTP verses POP.
7. Explain the features of IP address classes.
8. Describe VSAT network architecture and access technologies.
9. Explain briefly transparent bridge.
10. Explain ATM reference model with diagram.



**MODEL QUESTION BANK****Diploma in Computer Science & Engineering****III Semester****Course Title: Computer Network**

CO	Question	CL	Marks
I	Define the following terms – a. Data communication. b. Phase. c. Wavelength. d. Bandwidth. e. Throughput.	R	05
	Define the following terms – f. Periodic signal. g. Non-periodic signal. h. Latency. i. Jitter. j. Bit rate.	R	
	Illustrate different types of data flow.	R	
	Explain briefly the components of Data communication, with a diagram.	R	
	Discuss different forms of data representation.	U	
	Mention and explain the fundamental characteristics of data communication system.	U	10
	Explain the different categories of networks.	U	
	Explain briefly the components of Data communication, with a diagram.	U	
	Mention and explain the fundamental characteristics of data communication system.	U	
	II	Explain the different categories of networks.	U
Explain the need for networking.		A	
Explain the function of physical and data link layers of OSI model.		U	
Explain the function of presentation and application layers of OSI model.		U	
Explain the function of Transport layer and Session layers of OSI model.		U	
Explain TCP/IP reference model.		U	
List different network topologies. Explain with a diagram Ring Topology.		A	10
Classify types of hardware and software network components.		A	
Explain OSI reference model with neat diagram.		U	
Compare OSI and TCP/IP Reference Models.		U	
Compare Bus and Star Topologies with diagram.	A		
Compare Mesh and Hybrid Topologies with diagram.	A	5	
Explain the terms – a. Error detection. b. Error correction. c. Redundancy. d. Forward error correction. e. Re-transmission.	U		
Illustrate with examples different types of errors.	U		
Illustrate block coding with example.	A		



III	Mention some standard CRC Polynomials.	U	10		
	Discuss the advantages of Cyclic Codes.	A			
	Explain briefly CSMA protocol.	U			
	Write a note on CSMA/CD.	A			
	Explain with a diagram and an example, the process of error detection using block coding method.	A			
	With a diagram and an example, explain the structure of encoder and decoder in error correction.	A			
	Illustrate with a block diagram process of error detection in block coding.	A			
	Explain the design of CRC encoder and decoder, with an example.	A			
	With an example, explain CRC division with polynomials.	A			
	Discuss Controlled Access methods.	U			
IV	Describe the important factors to be considered when transmitting signal between two computers.	U	5		
	Explain coaxial cable with a diagram.	A			
	Write a note on optical fibre cable.	A			
	Explain multimode transmission of optical fibre.	U			
	Explain single mode transmission of optical fibre.	U			
	Describe the role of switches.	A			
	Explain the role of NIC.	A			
	List the benefits of WLAN verses Conventional LAN.	A			
	List and explain the uses of WLAN.	A			
	List the disadvantages of ARCNet.	A			
	Explain ARCNet data frame format.	U			
	Explain broadcasting in an Ethernet network.	A			
	Explain the features of Fast Ethernet.	A			
	Explain TCP/IP middle layer protocol.	A			
	Describe SMTP protocol.	A			
	Write a note on IMAP.	A			
	V	Explain different types of twisted pair cable with advantages and disadvantages.		A	10
		List and explain coaxial, twisted pair and optical fibre connectors.		A	
		Explain with a diagram Repeaters and Hubs.		A	
		Describe Wireless LAN with a diagram.		A	
Illustrate with a neat diagram media access in Ethernet.		A			
Describe the Token Ring Data frame format.		U			
Illustrate with a diagram media access in Token Ring.		A			
Explain FDDI Lower layer protocol.		A			
Explain HTTP and FTP Higher layer protocols.		A			
Compare SMTP verses POP.		A			
V	Explain the components of an IP address.	U	5		
	Explain the limitation of IP address classes.	U			
	Discuss different sub netting considerations.	U			
	Explain the limitations of sub netting.	U			
	Explain the features of IP address of classes.	U			
	Explain the process of dividing a network into subnets.	U			
	Explain communication across subnets with examples.	U			
	Differentiate between LAN and WAN technologies.	U			
	Explain the features of POTS.	U			

	Explain the advantages and disadvantages of Leased lines.	A	5
	Explain the working of ISDN.	U	
	Describe the components of VSAT network.	A	
	Identify and explain the different factors to be considered to access charges in WAN connectivity.	U	
	List the features of microwave connectivity.	U	
	Describe the content of Routing table.	U	
	Differentiate between Node-based Routing and Router-based Routing.	A	
	Explain briefly Routing Protocols.	U	
	Discuss frame relay protocol.	A	
VI	Illustrate the working of VPN with a neat diagram.	A	10
	Describe VSAT network architecture and Access technologies.	A	
	Compare the features of Radio and Infrared waves.	U	
	Compare PPTP and IPSec.	U	
	Explain briefly transparent bridge.	U	
	Explain briefly Source Route Bridge.	U	
	Describe different type of Gateways.	A	
	Discuss PPP and X.25 Protocol.	U	
	Explain ATM reference model with a diagram.	A	
	Illustrate the working of DNS with a diagram.	A	
Illustrate the working of WINS with a diagram.	A		
Illustrate the working of DHCP with a diagram.	A		

