

Ref No:

Sri Krishna Institute of Technology,  
Bangalore



## COURSE PLAN

Academic Year 2019-2020

Program:	B E – Information Science & Engineering
Semester :	4
Course Code:	18CS46
Course Title:	Data Communication
Credit / L-T-P:	3 / 3-0-0
Total Contact Hours:	40
Course Plan Author:	SINDHU G

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## A. COURSE INFORMATION

### 1. Course Overview

Degree:	BE	Program:	IS
Semester:	4	Academic Year:	2019-20
Course Title:	DATA COMMUNICATION	Course Code:	18CS46
Credit / L-T-P:	3-0-0	SEE Duration:	3 Hours
Total Contact Hours:	40	SEE Marks:	60 Marks
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	Sindhu G	Sign	Dt:
Checked By:		Sign	Dt:
CO Targets	CIA Target : 70%	SEE Target:	50%

**Note:** Define CIA and SEE % targets based on previous performance.

### 2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute.

Module	Content	Teaching Hours	Blooms Learning Levels
1	Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer-1: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding).	8 Hours	L3 Apply
2	Physical Layer-2: Analog to digital conversion (only PCM), Transmission Modes, Analog Transmission: Digital to analog conversion, Bandwidth Utilization: Multiplexing and Spread Spectrum, Switching: Introduction, Circuit Switched Networks and Packet switching.	8 Hours	L2 Understand
3	Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Forward error correction, Data link control: DLC services, Data link layer protocols, HDLC, and Point to Point protocol (Framing, Transition phases only).	8 Hours	L2 Understand
4	Media Access control: Random Access, Controlled Access and Channelization, Wired LANs Ethernet: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, Wireless LANs: Introduction, IEEE 802.11 Project and Bluetooth.	8 Hours	L2 Understand
5	Other wireless Networks: WIMAX, Cellular Telephony, Satellite networks, Network layer Protocols : Internet Protocol, ICMPv4, Mobile IP, Next generation IP: IPv6 addressing, The IPv6 Protocol, The ICMPv6 Protocol and Transition from IPv4 to IPv6.	8 Hours	L4 Understand
-	<b>Total</b>		

### 3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source

3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modul es	Details	Chapters in book	Availability
<b>A</b>	<b>Text books (Title, Authors, Edition, Publisher, Year.)</b>	-	-
1, 2, 3, 4, 5	Behrouz A. Forouzan, Data Communications and Networking 5E, 5 th Edition	1,2,3, 4,5	In Lib / In Dept
<b>B</b>	<b>Reference books (Title, Authors, Edition, Publisher, Year.)</b>	-	-
1, 2	1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks – Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.		In Lib
1, 2	2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.		Not Available
3, 4, 5	3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007. 4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007		In lib
<b>C</b>	<b>Concept Videos or Simulation for Understanding</b>	-	-
C1	<a href="http://library.aceondo.net/ebooks/Computer_Science/Data_Communication_and_Networking_by_Behrouz.A.Forouzan_4th.edition.pdf">http://library.aceondo.net/ebooks/Computer_Science/Data_Communication_and_Networking_by_Behrouz.A.Forouzan_4th.edition.pdf</a> <a href="https://www.youtube.com/watch?v=mYWslbszYQ">https://www.youtube.com/watch?v=mYWslbszYQ</a>		
C2			
C3			
C4			
C5			
<b>D</b>	<b>Software Tools for Design</b>	-	-
<b>E</b>	<b>Recent Developments for Research</b>	-	-
<b>F</b>	<b>Others (Web, Video, Simulation, Notes etc.)</b>	-	-
1			

#### 4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

Students must have learnt the following Courses / Topics with described Content . . .

Mod ules	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level
1	17CPL16/ 26	CPL	Knowledge about basic networks.	1/2	Basic knowledge about computer networks.	L2
2	17PCD13 /23	PCD	Knowledge about different types networks.	1/2	Different types of networks.	L2

#### 5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.

Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modules	Topic / Description	Area	Remarks	Blooms Level
1	Cellular Communication Techniques	Higher Study	Gap A seminar on Cellular technology	Understand L2
2	FM Stereo Broadcasting	Higher Study	NPTEL Video Lectures	Understand L2
3	Digital Communication Fundamentals and Application	Higher Study	NPTEL Video Lectures	Understand L2

## B. OBE PARAMETERS

### 1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs.

Modules	Course Code.#	Course Outcome At the end of the course, student should be able to . . .	Teach. Hours	Instr Method	Assessment Method	Blooms' Level
1	18CS46.1,2	Able to differentiate between OSI and TCP/IP models and identify the responsibility of each layer. Understand the concept of data and signal.	8	Discussions and Readings	Oral question answers and Explain	L3 Apply
2	18CS46.3,4	Understand and analyze the different types of Transmission media Demonstrate data transmission and data conversion.	8	Discussions and Readings	Analyze and examine and Take home test	L2 Understand
3	18CS46.5,6	Describe channel coding that encompasses techniques for encoding and decoding. Discuss different data link layer protocols.	8	Discussions and Readings	Questions are converget and describe in oral	L2 Understand
4	18CS46.7,8	Understand multiple access techniques and wired LANs. Explain basics of wireless communication.	8	Discussions and Readings	Oral and describe	L2 Understand
5	18CS46.9,10	Describe the architecture of wireless cellular telephony. Discuss the various network layer protocols.	8	Discussions and Readings	Student presentations or demonstrations within small groups	L2 Understand
-	-	<b>Total</b>	<b>50</b>	-	-	<b>L2-L4</b>

### 2. Course Applications

Write 1 or 2 applications per CO.

Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level
1	Network-aware applications to connect with the network. FTP, TFTP, POP3, SMTP and HTTP, Speech coding and transmission in digital mobile	CO1	L2
2	In Electronic devices which include twisted-pair cable, coaxial cable, and fiber optic cable, Computer hardware is built on the basis of certain standards	CO2	L3

3	Wireless control systems ,Ethernet for local area networks	CO3	L2
4	Earth Stations, Satellite Link Budget, Radio wireless technology include GPS units	CO4	L2
5	Mobile phone, Telecommunication networks	CO5	L2

### 3. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

Mod ules	CO.#	Course Outcomes <b>At the end of the course student should be able to . . .</b>	Program Outcomes															Lev el	
			PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3		
1	18CS46.1	Able to differentiate between OSI and TCP/IP models and identify the responsibility of each layer. 2.1.Understand the concept of data and signal.	2.1	2.1	2.1	2.1	-	1.5	1	-	-	2.1	-	-	-	-	-	-	L2
2	18CS46.2	Understand and analyze the different types of Transmission media,Demonstrate data transmission and data conversion.	2.1	2.1	2.1	2.1	-	-	-	-	-	2.1	1.5	2.1	-	-	-	-	L2
3	18CS46.3	Describe channel coding that encompasses techniques for encoding and decoding.Discuss different data link layer protocols.	2.1	2.1	2.1	2.1	1	-	-	-	-	2.1	-	2.1	-	-	-	-	L2
4	18CS46.4	Understand multiple access techniques and wired LANs.Describe the architecture of wireless cellular telephony.	2.1	2.1	2.1	2.1	-	1.5	-	-	-	2.1	-	2.1	-	-	-	-	L2
5	18CS46.5	Describe the architecture of wireless cellular telephony.Discuss the various network layer protocols.	2.1	2.1	-	-	-	-	-	-	-	2.1	-	2.1	-	-	-	-	L2
-	-	Average	2.1	2.1	2.1	2.1	1	1.5				2.1	1.5	2.1					-
-	PO, PSO	1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design																	

### 4. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Mod ules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1	Digital Communication Fundamentals and Applications	NPTEL Video Lectures	2 <sup>nd</sup> week / date	-	PO10
2	Cellular Communication Techniques	NPTEL Video Lectures	3 <sup>rd</sup> Week		PO10

## C. COURSE ASSESSMENT

### 1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation.

Modules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Network models and Digital Transmission	8	2	-	-	1	1	2	CO1,CO2,	L2
2	Data transmission and Data conversion.	8	2	-	-	1	1	2	CO3,CO4,	L3
3	Error Detection and Correction techniques and data link control.	8	-	2	-	1	1	2	CO5,CO6	L2
4	Media Access control and Wired and Wireless LANs.	8	-	2	-	1	1	2	CO7,CO8	L2
5	Wireless Networks and Network layer Protocols.	8	-	-	4	1	1	2	CO9,CO10	L2
-	<b>Total</b>	<b>40</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>10</b>	<b>-</b>	<b>-</b>

### 2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modules	Evaluation	Weightage in Marks	CO	Levels
1, 2	CIA Exam - 1	30	CO1, CO2,CO3,CO4,	L2, L3
3, 4	CIA Exam - 2	30	CO5,CO6,CO7,CO8	L2
5	CIA Exam - 3	30	CO9,CO10	L2
1, 2	Assignment - 1	10	CO1, CO2,CO3,CO4,	L2, L3
3, 4	Assignment - 2	10	CO5,CO6,CO7,CO8	L2
5	Assignment - 3	10	CO9,CO10	L2
1, 2	Seminar - 1	-	CO1, CO2,CO3,CO4,	L2, L3
3, 4	Seminar - 2	-	CO5,CO6,CO7,CO8	L2
5	Seminar - 3	-	CO9,CO10	L2
1, 2	Quiz - 1	-	-	-
3, 4	Quiz - 2	-	-	-
5	Quiz - 3	-	-	-
1 - 5	Other Activities - Mini Project	-	CO1 to CO10	L2, L3, L3
	<b>Final CIA Marks</b>	<b>40</b>	<b>-</b>	<b>-</b>

## D1. TEACHING PLAN - 1

### Module - 1

Title:		Appr Time:	10 Hrs
<b>a</b>	<b>Course Outcomes</b>	<b>CO</b>	<b>Blooms Level</b>
-	The student should be able to:	-	
1	Able to differentiate between OSI and TCP/IP models and identify the responsibility of each layer.	CO1	L2
2	Understand the concept of data and signal.	CO2	L2
<b>b</b>	<b>Course Schedule</b>	-	-
<b>Class No</b>	<b>Portion covered per hour</b>	-	-

1	Introduction: Data Communications	CO1	L2
2	Networks, Network Types,Internet History	CO1	L2
3	Standards and Administration	CO1	L2
4	Networks Models: Protocol Layering	CO1	L2
5	TCP/IP Protocol suite,The OSI model	CO1	L2
6	Introduction to Physical Layer-1: Data and Signals	CO2	L2
7	Digital Signals,Transmission Impairment,	CO2	L2
8	Data Rate limits,Performance	CO2	L2
<b>d</b>	<b>Review Questions</b>		
-			
-	The attainment of the module learning assessed through following questions	-	-
1	What is data Communication? List and explain the five components of data communication system.	CO1	L2
2	Explain point-to-point connection,Multipoint, Mesh Topology,Star Topology,Bus Topology	CO1	L2
3	Explain Layers in the TCP/IP Protocols	CO1	L2
4	Explain Multiplexing and Demultiplexing	CO1	L2
5	List and Explain five Line coding schemes	CO1	L2
6	Illustrate TCP/IP protocol suite and switching criteria.	CO1	L2
7	Explain the different categories of network.	CO1	L2
8	Explain OSI layers.define following i)Nose ii) distoration iii)Attenuation	CO1	L2
9	Explain the characteristics of line coding schemes.	CO2	L2
10	Explain unipolar and polar line coding with examples.		
11	Describe biopolar aand multilevel line coding schemes with examples.	CO2	L2
12	An analog signal has a bandwidth of 40KHZ. If we use four levels on signal. What is the minimum bandwidth of digital signal.?	CO2	L2
13	Explain the cause for transmission impairments.	CO2	L2
14	Define the following i)Jitter ii) transmission time iii) throughput iv) Latency	CO2	L2
15	Explain bandwidth delay product.	CO2	L2
<b>e</b>	<b>Experiences</b>	-	-
1		CO1	L2
2			

## Module – 2

Title:		Appr Time:	10 Hrs
<b>a</b>	<b>Course Outcomes</b>	<b>CO</b>	<b>Blooms Level</b>
-	The student should be able to:		
1	Understand and analyze the different types of Transmission media	CO3	L3
2	Demonstrate data transmission and data conversion.	CO4	L3
<b>b</b>	<b>Course Schedule</b>	-	-
<b>Class No</b>	<b>Portion covered per hour</b>	-	-
1	Digital Transmission:		
2	Digital to digital conversion	CO3	L3
2	Line coding: Polar	CO3	L3
3	Bipolar	CO4	L3
4	and Manchester coding	CO4	L3
5	Analog to digital conversion (only PCM)	CO4	L3
6	Transmission Modes	CO4	L3



7	Analog Transmission:	CO4	L3
8	Digital to analog conversion	CO4	L3
<b>c</b>	<b>Application Areas</b>	-	-
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	In Electronic devices which include twisted-pair cable, coaxial cable, and fiber optic cable.	CO3	L3
2	Computer hardware is built on the basis of certain standards	CO4	L3
<b>d</b>	<b>Review Questions</b>	-	-
-			
-	The attainment of the module learning assessed through following questions	-	-
1	Explain Pulse Code Modulation in detail?	CO3	L3
2	Explain the different mechanisms for modulating digital data into an analog signal.	CO3	L3
3	Explain the Transmission Modes.	CO3	L3
4	When is the use of Multiplexing justified? Mention and explain different types of multiplexing.	CO3	L3
5	Describe the different switched networks used in computer networks, mentioning specifically which of these need setup, transfer and tear-down phase.	CO3	L3
6	Explain digital to analog conversion.	CO4	L3
7	List and explain different types of sampling.	CO4	L3
8	With a neat diagram explain binary ASK and PSK.	CO4	L3
9	Expalin Quadrature phase shift keying in detail.	CO4	L3
10	Define the terms i) Modulation ii) Carrier frequency	CO4	L3
11	Explain different switching.	CO4	L3
<b>e</b>	<b>Experiences</b>	-	-
1		CO3	L2
2			

## E1. CIA EXAM – 1

### a. Model Question Paper - 1

Crs Code:		Sem:	I	Marks:		Time:		
Course:								
-	-	<b>Note: Answer all questions, each carry equal marks. Module : 1, 2</b>				<b>Marks</b>	<b>CO</b>	<b>Level</b>
1	a	Define data communication? Explain its components and characteristics.				05	CO1	L2
	b	Define topology and Explain the various types of topologies along with advantages and disadvantages with neat diagrams.				05	CO1	L2
	c	Describe <b>TCP/IP</b> protocol suit with neat diagram. Discuss the functionality of each layer				05	CO1	L2
		OR						
2	a	Explain the transmission of digital signal.				06	CO2	L2
	b	What is transmission impairment? Mention the types of them.				03	CO2	L2
	c	Explain polar schemes with neat diagrams.				06	CO2	L2
		OR						
3	a	Explain the addressing, encapsulation and decapsulation using TCP/IP layers. with a neat diagram				07	CO3	L3
	b	Explain Encoder and Decoder for simple parity check with example.				08	CO3	L3
		OR						
4	a	With neat diagram explain CRC encoder and decoder.				08	CO4	L3
	b	Explain the types of errors and the process of error detection in block coding.				07	CO4	L3


## b. Assignment -1

Model Assignment Questions					
Crs Code:		Sem:		Marks:	
Course:					
SNo	Assignment Description	Marks	CO	Level	
1	Define DC component and its effect on Digital transmission.	8	CO1	L2	
2	Distinguish between a signal element and a data element.	8	CO2	L2	
3	Explain the three types of transmission impairment	6	CO2	L4	
4	Explain the application layer protocol in detail	8	CO2	L4	
5	Explain Addressing in TCP/IP Protocols	8	CO1	L4	
6	What is Line Coding? Explain with example the different Line coding schemes used for digital to digital conversion.	6	CO2	L2	
7	Explain Pulse Code Modulation in detail?	6	CO3	L2	
8	Explain the Transmission Modes.	6	CO4	L2	
9	When is the use of Multiplexing justified? Mention and explain different types of multiplexing.	6	CO4	L2	
10	What is the concept of Spread Spectrum? Explain i) Frequency Hopping Spread Spectrum (FHSS) ii) Direct Sequence Spread Spectrum (DSSS)	8	CO3	L2	

## D2. TEACHING PLAN - 2

### Module – 3

Title:		Appr Time:	10 Hrs
<b>a</b>	<b>Course Outcomes</b>	<b>CO</b>	<b>Blooms Level</b>
-	At the end of the topic the student should be able to ...	-	-
1	Describe channel coding that encompasses techniques for encoding and decoding.	CO5	L2
2	Discuss different data link layer protocols.	CO6	L2
<b>b</b>	<b>Course Schedule</b>		
<b>Class No</b>	<b>Portion covered per hour</b>	<b>-</b>	<b>-</b>
1	Bandwidth utilization	CO5	L2
2	Multiplexing and spread spectrum	CO5	L2
3	Switching: Introduction	CO5	L2
4	Circuit switched networks	CO5	L2
5	Packet switching	CO5	L2
6	Error Detection and correction: Introduction	CO6	L2
7	Block coding	CO6	L2
8	Cyclic codes, Cheksum	CO6	L2
<b>c</b>	<b>Application Areas</b>	<b>-</b>	<b>-</b>
-	Students should be able employ / apply the Module learnings to ...	-	-
1	Wireless control systems	CO5	L2

2	Ethernet for local area networks	CO6	L2
<b>d</b>	<b>Review Questions</b>	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Describe different types of errors.	CO5	L2
2	Infer the meaning of hamming distance? Explain the block diagram of simple parity check code C (5, 4) with dmin = 2.	CO5	L2
3	What is a High – level Data Link Control (HDLC) protocol? Indicate in diagrammatic form, the frame format of different HDLC frames.	CO6	L2
4	What is framing? Explain a. Character Oriented framing b. Bit Oriented framing.	CO6	L2
5	Find the code word, using CRC given data word "1001" and generator "1011".	CO5	L2
6	Explain with neat diagram the error detection in block coding.	CO5	L2
7	Explain how CRC used in detecting errors for the following polynomial $g(x)=x+1$ and $d(x)=1101011011$	CO5	L2
8	Explain DLC services in datalink control.	CO6	L2
9	Explain stop and wait protocol.	CO6	L2
10	Explain HDCL Proctol.	CO6	L2
<b>e</b>	<b>Experiences</b>	-	-
1		CO6	L2
2			

## Module – 4

Title:	Data Transmission and Telemetry Measurement of Non – Electrical Quantities	Appr Time:	10 Hrs
<b>a</b>	<b>Course Outcomes</b>	<b>CO</b>	<b>Blooms Level</b>
-	At the end of the topic the student should be able to . . .	-	
1	Understand multiple access techniques and wired LANs.	CO7	L2
2	Explain basics of wireless communication.	CO8	L2
<b>b</b>	<b>Course Schedule</b>		
<b>Class No</b>	<b>Portion covered per hour</b>	-	-
1	Data link protocols	CO7	L2
2	Point to point protocol framing, Transition phase only	CO7	L2
3	Media Access control Random access	CO7	L2
4	Controlled Access and Channelization	CO7	L2
5	Introduction to Data Link Layer	CO7	L2
6	Link Layer Addressing,ARP	CO8	L2
7	IPV4 addressing and subnetting:	CO8	L2
8	Classful and CIDR addressing, DHCP,NAT	CO8	L2
		CO8	L2
<b>c</b>	<b>Application Areas</b>	-	-
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Earth Stations, Satellite Link Budget,	CO7	L2
2	Radio wireless technology include GPS units	CO8	L2

<b>d</b>	<b>Review Questions</b>	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	What is random access? Explain following random access protocols. a. Pure ALOHA b. Slotted ALOHA	CO7	L2
2	Explain any two popular controlled access methods, with a neat diagram.	CO7	L2
3	Discuss IEEE 802.3 MAC frame format. Mention the restriction imposed on minimum and maximum lengths of an 802.3 frame.	CO8	L2
4	Explain the IEEE 802.11 architecture.	CO8	L2
5	Explain three types of controlled access.	CO7	L2
6	Explain different channelization.	CO7	L2
7	Describe ethernet protocol.	CO7	L2
8	List and explain characteristics of standard ethernet.	CO7	L2
9	Explain the frame work of PCF	CO8	L2
10	Explain bluetooth architecture.	CO8	L2
11	Explain the transition phase with diagram	CO8	L2
12	Explain different types of services in wireless LANS	CO8	L2
<b>e</b>	<b>Experiences</b>	-	-
1		CO7	L2
2			

## E2. CIA EXAM – 2

### a. Model Question Paper - 2

Crs Code:	Sem:	Marks:	Time:				
Course:							
-	-	<b>Note: Answer all questions, each carry equal marks. Module : 3, 4</b>			<b>Marks</b>	<b>CO</b>	<b>Level</b>
1	a	Explain stop and wait protocol with appropriate diagrams.	7	CO5	L2		
	b	What is Internet checksum? List the steps undertaken by sender and receiver for error detection in Internet checksum	8	CO5	L2		
OR							
2	a	Explain polling and reservation of controlled access with diagram.	8	CO6	L2		
	b	Explain working of CSMA/CA with suitable flow diagram	7	CO5	L2		
3	a	Explain different frame types in HDLC.	8	CO8	L2		
	b	Explain transition phases of PPP protocol with neat diagram.	7	CO8	L2		
OR							
4	a	What is channelization? Explain FDMA	7	CO7	L2		
	b	Describe pure ALOHA and slotted ALOHA	8	CO7	L2		

### b. Assignment – 2

Model Assignment Questions						
Crs Code:	Sem:	Marks:	Time:			
Course:						
SNo	Assignment Description			Marks	CO	Level
1	Explain with example error detection with respect to block coding.			8	CO5	L2
2	Find the code word $c(x)$ , using CRC for the information $d(x) = x^3 + 1$ with generator polynomial $t(x) = x^3 + x + 1$			8	CO5	L2

4	What is internee checksum? With an example list the steps done by the sender and the receiver for error detection.	10	CO6	L2
5	Briefly explain the forward error correction.	5	CO6	L2
6	Explain a. Simple Protocol b. Stop and Wait Protocol		CO7	L2
7	Explain PPP and Transition Phases	8	CO8	L2
8	Explain the following random access protocols along with the neat flow diagram. a. CSMA b. CSMA/CD c. CSMA/CA	12	CO7	L2
9	Write short notes on four of the popular standard Ethernet common implementations.	8	CO7	L2
10	Explain the following channelization techniques. a. FDMA b. TDMA c. CDMA	12	CO7	L2
11	Discuss the IEEE 802.11 MAC layer frame format along with the addressing mechanisms.	8	CO8	L2
12	Explain Bluetooth Layers. Explain the architecture of Bluetooth.	8	CO8	L2

### D3. TEACHING PLAN - 3

#### Module – 5

Title:	Loop and Horn Antenna and Antenna Types	Appr Time:	10 Hrs
<b>a</b>	<b>Course Outcomes</b>	<b>CO</b>	<b>Blooms Level</b>
-	At the end of the topic the student should be able to . . .	-	
1	Describe the architecture of wireless cellular telephony.	CO9	L2
2	Discuss the various network layer protocols.	CO10	L2
<b>b</b>	<b>Course Schedule</b>	-	-
<b>Class No</b>	<b>Portion covered per hour</b>	-	-
1	Wired LAN's Ethernet" Ethernet protocol	CO9	L2
2	Standard Ethernet, Fast Ethernet	CO9	L2
3	Gigabit Ethernet And 10 Gigabit Ethernet	CO9	L2
4	Wireless LAN	CO10	L2
5	IEEE 802.11 project	CO10	L2
6	Bluetooth	CO10	L2
7	Other wireless Networks	CO10	L2
8	Cellular Telephony	CO10	L2
<b>c</b>	<b>Application Areas</b>	-	-
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Mobile phone	CO9	L2
2	Telecommunication networks	CO10	L2
<b>d</b>	<b>Review Questions</b>	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Explain IPv4 datagram format (along with options explanation)	CO10	L2
2	Explain the following debugging tools a. PING b. Tracert	CO10	L2

3	Explain the IPv6 addressing mechanisms.	CO10	L2
4	Explain the IPv6 Packet format.	CO10	L2
5	Explain datagram format.	CO9	L2
6	Describe data fragmentation.	CO9	L2
7	Explain general format for ICMP.	CO10	L2
8	Distinguish between IPV4 and IPV6.	CO10	L2
9	Give the frame format of 802.11 and explain	CO9	L2
10	Define terms piconet and scatternet.	CO9	L2
11	Using an example show the checksum calculation in ICMP4	CO9	L2
12	What is meant by hidden station problem.explain.	CO10	L2
<b>e</b>	<b>Experiences</b>	-	-
1		CO10	L2
2		CO9	

### E3. CIA EXAM – 3

#### a. Model Question Paper - 3

Crs Code:		Sem:		Marks:		Time:		
Course:								
-	-	<b>Note: Answer all questions, each carry equal marks. Module : 5</b>				<b>Marks</b>	<b>CO</b>	<b>Level</b>
1	a	Explain IEEE802.11 project architecture.			8	CO9	L2	
	b	Explain the operation of cellular telephony.			7	CO9	L2	
		OR						
2	a	Explain briefly the 3 categories of satellites.			8	CO9	L2	
	b	Explain different types of addressing mechanism in IEEE 802.11.			7	CO9	L2	
3	a	Discuss 802.11 MAC frame format.			8	CO10	L2	
	b	Explain Bluetooth architecture with neat diagram.			7	CO10	L2	
		OR						
4	a	Explain IP datagram header format with neat diagram and give description of each field.			8	CO10	L2	
	b	Explain WiMax Architecture.			7	CO10	L2	
	b	Explain in detail, the yagi-uda antenna. Write the design equations for dimensions of different elements of antenna			5	CO10	L2	
	c	Write a note on paraboloid? Explain the principle of parabolic reflector with the help of a neat diagram.			5	CO10	L2	

#### b. Assignment – 3

<b>Model Assignment Questions</b>							
Crs Code:		Sem:		Marks:		Time:	
Course:							
<b>SNo</b>	<b>Assignment Description</b>				<b>Marks</b>	<b>CO</b>	<b>Level</b>
1	Write short notes on a. WiMAX b. Cellular Telephony c. Satellite Networks				5	CO9	L2
2	Write short notes on ICMPv4 and ICMPv6 messages.				5	CO9	L3
3	Explain the concept of Mobile IP.				8	CO10	L4
4	Explain the advantages of IPv6 over IPv4				5	CO10	L3
5	Explain the different methods of transition from IPv4 to IPv6				8	CO10	L3
6	Distinguish between IPV4 and IPV6.				6	CO5	L2

7	Give the frame format of 802.11 and explain	5	CO5	L2
8	Define terms piconet and scatternet.	4	CO5	L2
9	Using an example show the checksum calculation in ICMP4	8	CO5	L2
10	What is meant by hidden station problem.explain.	5	CO5	L2
11	Explain IPv4 datagram format (along with options explanation)	5	CO5	L2
12	Explain the following debugging tools a. PING b. Tracert	5	CO5	L2

## F. EXAM PREPARATION

### 1. University Model Question Paper

Course:	Sensors and Transducers				Month / Year	May /2018			
Crs Code:	15EE662	Sem:	6	Marks:	80	Time:	180 minutes		
Mod ule	Answer all FIVE full questions. All questions carry equal marks.					Marks	CO	Level	
1	a	What is data Communication? List and explain the five components of data communication system.				6	CO1	L2	
	b	What are the four levels of addresses used in internet employing TCP/IP?				8	CO1	L2	
	c	With sketch, explain two types of wide area network in use.				6	CO1		
		<b>OR</b>							
1	a	Four 1-kbps connections are multiplexed together. A unit is 1 bit. Find (1) the duration of 1 bit before multiplexing, (2) the transmission rate of the link, (3) the duration of a time slot, and (4) the duration of a frame.				10	CO2	L2	
	b	Define direct sequence spread spectrum (DSSS) and explain how it achieves bandwidth spread using relevant sketch.				10	CO2	L2	
2	a	Write a descriptive note on three causes of transmission impairment.				8	CO3	L4	
	b	Explain the transmission modes?				6	CO3	L4	
	c	Explain PCM in detail.				6	CO3	L4	
		<b>OR</b>							
2	a	Define the following: a. Frequency shift Keying: b. Base band transmission: c. Broad band transmission: d. SNR: e. Nyquist bit rate:				10	CO4	L4	
	b	Draw the graph of the NRZ-L, NRZ-I, Manchester, differential Manchester scheme using each of the following data streams, assuming that the last signal level has been positive. a. 00000000 b. 11111111 c. 01010101 d. 00110011				10	CO4	L4	
3	a	What is FDM? Briefly explain its multiplexing and demultiplexing process.				6	CO5	L2	
	b	Four sources create 250 characters per second. The frame contain one character from each source create 250 characters per second. The frame contain one character from each source and one extra bit for synchronization.				6	CO5	L2	
	c	What is time division multiplexing? Explain how statistical TDM overcomes the disadvantages of synchronous TDM.				8	CO5	L2	
		<b>OR</b>							
3	a	With neat sketch, explain two approaches used in variable size framing.				8	CO6	L2	

	b	What are the three types of HDLC frames used in HDLC bit oriented protocol? Explain its significance with its structure. Show how that frames can be used for exchange of data using piggy backing.	8	CO6	L2
	c	Show two types of networks used in Bluetooth	4	CO6	L2
4	a	Explain error detection and error correction with respect to block coding	8	CO7	L2
	b	Find the codeword using CRC given data word "1001" and generator "1011"	9	CO7	L2
	c	Describe different types of errors.	3	CO7	L2
		<b>OR</b>			
4	a	Explain the frame format and transitional phases of point to point protocol.	8	CO8	L2
	b	With neat sketch, explain BSS and ESS	8	CO8	L2
	c	Explain with necessary sketch IEEE 802.11 addressing mechanism	4	CO8	L2
5	a	Describe 802.3 Mac frame	8	CO9	L2
	b	Explain: i) CSMA ii) CSMA/CD	12	CO9	L2
		<b>OR</b>			
5	a	Explain IEEE 802.11 architecture.	10	CO10	L2
	b	Explain in detail IPv6 packet format	10	CO10	L2

## 2. SEE Important Questions

Course:					Month / Year		
Crs Code:		1	Sem:	Marks:	Time:		
<b>Note</b>		Answer all FIVE full questions. All questions carry equal marks.			-	-	Year
Mod ule	Qno.	Important Question			Marks	CO	Year
1	1	What is data communication? Explain with neat sketch three types of communication between the devices considering data flow.			8	CO1	2014
	2	Give four levels of addresses used in TCP/IP protocol and give its significances			4	CO1	2017
	3	Explain different types of transmission modes.			4	CO2	2015
	4	Four 1-kbps connections are multiplexed together. A unit is 1 bit. Find (1) the duration of 1 bit before multiplexing, (2) the transmission rate of the link, (3) the duration of a time slot, and (4) the duration of a frame.			10	CO2	2015
	5	Define direct sequence spread spectrum (DSSS) and explain how it achieves bandwidth spread using relevant sketch			8	CO2	2016
2	1	What is Latency? List out its components			8	CO3	2017
	2	Give the block diagram of PCM encoder and state the role of each processes.			8	CO3	2018
	3	What is multiplexing? Differentiate synchronous TDM with statistical TDM giving the working of both procedures in brief			10	CO3	2017
	4	Give the block diagram of PCM encoder and state the role of each processes.			7	CO4	2016
	5	What is Line Coding? Explain with example the different Line coding schemes used for digital to digital conversion.			8	CO4	2015
3	1	Give the details of minimum and maximum length of Ethernet frame. With an example, explain the format of Ethernet addresses.			8	CO5	2015
	2	Explain working of CDMA with suitable example.			8	CO5	2015
	3	Explain PPP and Transition Phases			8	CO5	2017
	4	Find the codeword using CRC given data word "1001" and generator "1011".				CO6	2014



	5	What is a High – level Data Link Control (HDLC) protocol? Indicate in diagrammatic form, the frame format of different HDLC frames.	10	CO6	2015
4	1	Explain with necessary sketch IEEE 802.11 addressing mechanism	8	CO7	2014
	2	Mention the five goals of fast Ethernet. And give the importance of "AUTONEGOTIATION"	8	CO7	2016
	3	Mention different categories of standard Ethernet and explain implementation of 10 base 5 thick Ethernet.	8	CO7	2017
	4	Describe 802.3 Mac frame	8	CO8	2018
	5	What is random access? Explain following random access protocols. a. Pure ALOHA b. Slotted ALOHA	10	CO8	2014
5	1	List the deficiency of IPv4 and advantages of IPv6 over IPv4	8	CO9	2015
	2	Explain the following debugging tools a. PING b. Tracert	6	CO9	2016
	3	Give the IPv4 datagram format and brief description of each field	8	CO9	2015
	4	Draw format of IPv6 datagram and explain.	8	CO10	2014
	5	Explain the concept of Mobile IP.	8	CO10	2017

