GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: COMPUTER NETWORKS
(COURSE CODE: 3351105)

Diploma Programme in which this course is offered	Semester in which offered
Electronics and Communication Engineering	5th Semester

1. RATIONALE

Computers and computer networks are the sole of the present telecommunication system. Advanced digital communication system is based on the computer networks. Now a days every organisation, industry or the service sector own their private computer networks. Therefore in every organisation, the maintenance of the computer networks becomes one of the essential jobs of a diploma electronics engineer too. This course is therefore designed to help the Electronics and Communication diploma holders to develop this competency.

2. LIST OF COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Maintain hardware of various types of computer networks.**

3. COURSE OUTCOMES

The theory should be taught and practical should be performed in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Identify computer network on the basis of various network parameters.
ii. Identify OSI-ISO and TCP/IP computer network models.
iii. Select guided and unguided medium for various types of data transmission.
iv. Assign IP address to the network and network component as per the networks.
v. Install various types of modems and other network hardware.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
4	0	2	6	70	30	20	30	

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** - Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

5. COURSE DETAILS

Unit	Major Learning Outcomes (Outcomes in Cognitive Domain)	Topics and Sub-topics
Unit – I Network Fundamentals	1a. State the necessity of Computer Networks	1.1 Need and Advantages of Computer Networks
	1b. Discuss the applications of Computer Networks	1.2 Applications of computer networks: Business, Industrial and home applications
	1c. Describe the functions of various components of Computer Networks	1.3 Components of Computer Networks: hardware and software
	1d. Compare various computer network topologies.	1.4 Network topologies: Star, Ring, Bus, Mesh, Tree, Hybrid
	1e. Classify computer networks- Based on Transmission, scale , and Architecture 1f. Differentiate LAN, WAN,MAN 1g. Describe configuration of PAN with example 1h. State the applications service offered by WAN 1i. Explain functions of VPN with example	1.5 Network Classification i. Based on Transmission Technologies: Point-to-point, broadcast ii. Based on scale: PAN, LAN, WAN, MAN,VPN, Internet iii. Based on Architecture: Peer to Peer, Client Server, advantages of Client Sever over Peer-to-Peer Model
Unit – II Reference Model	2a. Define the terms: Protocol, Interface, Services, Primitives, semantics, syntax	2.1 Terms :Protocol, Interface, Services, Primitives, semantics, syntax
	2b. Explain the need for layer modelling. 2c. Describe the functions of each layer of OSI Reference model.	2.2 The OSI-ISO Reference Model:, Brief functional description of each layers with list of protocols
	2d. Describe the functions of each layer of TCP/IP Reference model. 2e. Compare the major features of OSI and TCP/IP model	2.3 The TCP/IP Reference Model: Brief functional description of each of the Layer with list of protocols
Unit – III Network Media and Hardware	3a. Explain characteristics of guided and unguided transmission media 3b. Describe specifications of UTP and coaxial cable 3c. Sketch constructional details of UTP and coaxial cable with labels	3.1 Transmission Media: Unguided and Guided media, Wired and Wireless, UTP, Coaxial and Fiber optical cable
	3d. Sketch the various line signals 3e. Describe characteristics of physical layer connectors 3f. Explain need of line coding.	3.2 Physical Layer Interfaces: Types of Connectors and Signals 3.3 Line coding and Line coded signal
	3g. Explain structure of MAC and LLC sublayers	3.4 Sub layers of Data Link Layers: MAC,LLC

Unit	Major Learning Outcomes (Outcomes in Cognitive Domain)	Topics and Sub-topics
	3h. Explain functions of following network devices: Repeater, Hub, Bridge, Switch , Router, B-router, Gateway, Network Adapter, Access point, Wireless Access points 3i. Differentiate between FDDI and CDDI	3.5 Network devices: Repeater, Hub, Bridge, Switch , Router, B-router, Gateway, Network Adapter, Access point, Wireless Access points, 3.6 Fast and Gigabit Ethernet 3.7 FDDI and CDDI
	3j. Describe functions of remote connecting devices: DTE and DCE	3.8 Remote connecting device: DTE and DCE 3.9 Digital Subscriber Line technology: DSL, ADSL, HDSL
	3k. Compare the functions of various types of Servers	3.10 Servers: File, Print, Mail, Proxy, Web
Unit – IV Internet architecture	4a. Explain IP addressing scheme with examples	4.1 Internet addresses: gateway addressing, network and broadcast addressing, dotted decimal notation, loopback addressing
	4b. Distinguish various components of IP v4 and IPv6 protocol.	4.2 IP layer Protocols: IPv4 and IPv6 frame Format
	4c. Compare functions and services TCP and UDP	4.3 Connection oriented and Connectionless services 4.4 TCP and UDP frame format
	4d. Differentiate between DNS, Email and FTP	4.5 Domain Name System: Introduction, mapping to IP addresses
	4e. Explain the working of a Firewall used for network security. 4f. Describe role of Cyber security Laws	4.6 Security –Social issues, Hacking, precautions and Firewall, Cyber security Laws
Unit – V Internet Services and its applications	5a. Describe the functions of cable modem.	5.1 Cable modem system
	5b. Compare ADSL and broad band modem 5c. Classify different Internet Services 5d. Differentiate FTP and Remote login 5e. Explain how Voice and Video is transferred over IP.	5.2 ADSL and broad band modem 5.3 Internet Services World Wide Web: Web browser, HTML, web servers 5.4 Electronic Mail: Functions of E-mail system, User agent, Message format , Mail Protocols (SMTP, POP3),FTP, Remote

Unit	Major Learning Outcomes (Outcomes in Cognitive Domain)	Topics and Sub-topics
		Login 5.5 Voice and Video over IP 5.6 Social services: Forum, Newsgroup, blog

6. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Network Fundamentals	12	4	7	4	15
II	Reference Models	08	5	5	3	13
III	Network Media and Hardware	12	5	5	4	14
IV	Internet architecture	14	6	4	3	13
V	Internet Services and Applications	10	5	6	4	15
Total		**56**	**25**	**27**	**18**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)
Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills ***(outcomes in psychomotor and affective domain)*** so that students are able to acquire the competencies/course outcomes. Following is the list of practical exercises for guidance.

Note*: outcomes in psychomotor domain are listed here as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty members should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise (Outcomes in the Psychomotor Domain)	Apprx. Hrs. Required
1	I	Prepare detailed report of existing LAN in the Department/Institute	04
2	I	Connect computer terminal in various physical topologies and test	02

S. No.	Unit No.	Practical/Exercise (Outcomes in the Psychomotor Domain)	Apprx. Hrs. Required
		the data transfer	
3	III	Compare performance of various types physical layer Connectors	02
4	III	Compare performance of various types of Transmission media. and Connectors	02
5	III	Prepare and Test Straight UTP Cable	02
6	III	Prepare and Test Cross UTP Cable	02
7	III	Prepare and Test Cross CAT5,CAT6 and RJ11Cable	03
8	III	Install/configure/Test Network Interface Card/port	03
9	III	Install/configure/Test Networking devices	04
10	III	Install/configure/Test small LAN using Hub/switch	03
11	III	Install/configure/Test File Server	03
12	III	Install/configure/Test Print Server	03
13	III	Install/configure/Test Web Server	03
14	IV	Install/configure/Test a small wireless network using access points	02
15	IV	Install/configure/Test Peer to Peer LAN and sharing of resources	03
16	IV	Install/configure/Test Network operating System	03
17	IV	Configure/Test Internet connectivity	03
18	IV	Install and configure a Firewall for the network security	02
19	IV	Check performance of network using ping, trace route commands	02
20	V	Prepare report on e-mail service: contact list, group list, sorting, searching, spam, inbox, sent mail, draft	02
21	V	Compare the performance of various web browser: home page, cookies, bookmark, history, favourites, download folder etc	02
22	V	Use simple Network Commands for the network control operations	02
Total Hours (perform practical form every unit so that 28 hours are utilized)			**57**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

i. Prepare technical report on Current Network at your Department/ Institute.
ii. Test the performance of HUB, Switches, router and Servers.
iii. Project- Build a small PAN/ LAN at your Home /Community.
iv. Enhance security of your network by introducing Firewall.

9. INSTRUCTIONAL STRATEGY

i. Lecture and demonstration
ii. Online animation/flash
iii. Practical exercises, LAN implementation
iv. Mini project related with industrial applications and house hold applications

10. SUGGESTED LEARNING RESOURCES

(A) List of Books

S. No.	Title of Books	Author	Publication
1.	Data Communication and Networking,	Forouzen	Tata McGraw Hill, Education New Delhi (Latest edition)
2.	Computer Networks	Tannebaum AndrewS Wetherall David J.	Pearson, New Delhi, 5th Edition, 2011
3.	Data and Computer Communication,	Stallings Williams	PHI Learning, New Delhi (Latest edition)
4.	Data Communication Networks	Sharma Sanjay	S.K.Kataria and Sons, New Delhi (Latest edition)
5.	Computer Networks	Trivedi Bhushan	Oxford University Press, New Delhi 2013

(B) List of Major Equipment/accessories

i. Computer systems(P-IV and above)
ii. Network Cable Cat 5/Cat 6.
iii. Crimping Tool (RJ45,RJ11, Cat 5/Cat 6)
iv. UTP Cable Tester
v. Layer 2 Switch ,Hub(16 I /O)
vi. Wireless Access point and Wireless router
vii. Network cable connectors(Cat 5/Cat 6/C2G, RJ45,RJ11)
viii. Network Trainer Kit

(C) List of Software/Learning Websites

i. http://nptel.iitm.ac.in/courses.php?disciplineId=106
ii. http://www.edrawsoft.com
iii. Network Simulator Tool: GNS3 v0.8.5, NetSimK
iv. www.learnerstv.com

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. D B VAGADIA** HOD (EC) Govt. Poly, Rajkot
- **Prof S N SAMPAT**, Sr. Lecturer (EC) Govt. Poly Gandhinagar.
- **Prof U V BUCH**, Sr. Lecturer (EC) Govt. Poly for Girls, Surat
- **Prof P.G.PATEL**, Lecturer (EC) Govt. Poly Ahmedabad.

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. (Dr.) (Mrs.) Anjali Potnis,** Department of Electrical and Electronics Engineering