GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

DATA COMMUNICATION AND NETWORKING
(Code: 3330302)

Diploma Programmes in which this course is offered	Semester in which offered
Biomedical engineering	Third

1. RATIONALE

Most of the biomedical instruments are now days computer-based or connected with computers. The biomedical diploma engineers are required to install, operate and maintain such medical equipment and their attachments, to obtain the correct results, as it is crucial for the treatment of the patients. They also solve the related electronic and computer network problems. Therefore this course has been designed to develop the basic skills required for networking computers with medical equipment and each other for data communication.

2. COMPETENCY (Programme Outcome according to NBA Terminology)

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:

- **Network medical equipment and their attachments with computers and with each other to communicate data effectively.**

3. 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
3	0	2	05	70	30	20	30	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit **ESE** - End Semester Examination; **PA** - Progressive Assessment.

4. COURSE DETAILS

Unit	Major Learning Outcomes ('Course Outcomes' in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Data Conditioning and Transmission	1a. Describe the communication model and modes of transmission. 1b. Define analog and digital signals. 1c. Explain A/D and D/A convertor	1.1 Communication model: Block diagram 1.2 Analog and digital signals 1.3 A/D and D/A converters
	1d. Differentiate between Asynchronous and Synchronous modes of transmission. 1e. Distinguish between FDM, TDM multiplexing techniques. 1f. Discriminate between analog and digital switching techniques.	1.1 Asynchronous and Synchronous modes of Transmission 1.2 Transmission Modes: Simplex, Half Duplex, Full Duplex 1.3 Multiplexing Techniques: FDM, TDM 1.4 Routing Techniques: Circuit Switching, Packet Switching
Unit– II Introduction to Computer Network	2a. Justify the need of computer network. 2b. Distinguish between internet and intranet 2c. Distinguish between Star, Bus, Ring and Mesh topologies	2.1 Need of computer network 2.2 Concept of internet and intranet 2.3Network Topologies :Star, Bus, Ring, Mesh
	2a. Differentiate between LAN, WAN, MAN and wireless LAN network topologies. 2b. Describe the OSI and TCP/IP Reference network models.	2.4 Type of network LAN, MAN, WAN, Wireless LAN:Bluetooth, Wi-Fi 2.5 Concept of OSI and TCP/IP Reference models (Layer)
Unit– III Network Hardware and Software	3a. Distinguish various servers. 3b. Name the various transmission media and connectors.	3.1 Server: client server, file server, print server 3.2 Transmission media: twisted pair, coaxial, fiber, free space
	3c.Describe the NIC interconnection devices with sketches	3.3 Network interface Card (NIC); Interconnection devices, Repeater, Bridge, Router, Gateway, Switch 3.4 Connectors: T, BNC, RJ-45 Terminator
Unit – IV Network Applications and Integrated Service Digital Networks	4a. Describe the concept of DNS, HPFS, NTFS, FAT, FTP. 4b. Differentiate between ISDN and broad band ISDN. 4c. Distinguish between data communication and inter-networking.	4.1. Domain Name System (DNS), New Technology File System (NTFS), High Performance File System(HPFS), File Allocation Table (FAT), File Transfer Protocol (FTP) 4.2. ISDN; Broad band ISDN 4.3. Data communication 4.4. Inter networking
Unit – IV Basics of Analog and Digital	5a. Describe basic communication system with block diagrams. 5b. Justify the need for various modulation techniques and	5.1. Basic communication system 5.2. Modulation techniques: Necessity of modulation, Amplitude modulation, Frequency modulation, Phase

Unit	Major Learning Outcomes ('Course Outcomes' in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Communication	receivers. 5c. Distinguish between analog and digital modulation techniques. 5d. Differentiate between AM and FM receiver systems	modulation 5.3. Digital modulation (PAM,PWM,PCM) 5.4. Analog transmission of digital data (ASK, FSK, PSK) 5.5. Communication receivers :AM receiver, FM receiver

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Data Conditioning and Transmission	08	04	12	00	16
II	Introduction to computer network	08	00	08	04	12
III	Network Hardware and Software	05	04	04	02	10
IV	Network Applications Integrated Service Digital Networks	07	04	06	04	14
V	Basics of Analog and Digital Communication	14	06	10	02	18
	Total	**42**	**18**	**40**	**12**	**70**

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

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

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

Note: Here only course outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes** in ***affective domain*** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain

S. No.	Unit No.	Practical Exercise/Experiment ('Course Outcomes' in Psychomotor Domain according to NBA terminology)	Hrs. required
1	II	Network the various computer topologies.	02
2	II	Prepare computer system for network.	02
3	II	Install and test Ethernet network interface card and configure it.	02
4	III	Install and test various network connection.	02
5	III	Install network client server and configure.	02

S. No.	Unit No.	Practical Exercise/Experiment ('Course Outcomes' in Psychomotor Domain according to NBA terminology)	Hrs. required
6	III	Install network file server and configure.	02
7	III	Install network print server and configure.	02
8	I	Perform time division multiplexing.	02
9	I	Perform frequency division multiplexing.	02
10	III	Communicate signals between two devices by serial communication.	02
11	IV	Install, configure Internet on PC and access e-mail accounts.	02
12	III	Study of Router, repeater and Bridge connected in network.	02
13	V	Test the performance of Amplitude Modulation on Trainer kit.	02
14	V	Test the performance of Frequency Modulation on Trainer kit.	02
15	V	Test the performance of Phase Modulation on Trainer kit.	02
16	V	Test the performance of Pulse Code Modulation on Trainer kit.	02
Total			**32**

Note: Ask students to perform enough number of practical such that all the units are covered within 28 hours. (Different students may be asked to do different practical)

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

i. Student should perform various tasks related to computer and Internet in laboratory.
ii. Student may visit 'DOORDARSHAN' or/and FM radio centre nearby.

8. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

i. Class Test
ii. Assignment
iii. Seminar/Symposium
iv. Continuous evaluation of lab activity
v. Arranging Industrial visit.

9. SUGGESTED LEARNING RESOURCES

A) List of Books

S.No.	Title of Book	Author	Publication
1.	Computer Networks	Tanenbaum, Andrew S and David J. Wetherall	PHI Learning, New Delhi, latest edition
2.	Data Communication and Networking	Forouzan, Behrouz A.	TMH, New Delhi, latest edition
3.	Telecommunication Switching System and Networks	Vishwanathan, T	PHI Learning, New Delhi, latest edition
4.	Electronic Communication	Roddy, Dennis and Coolen, John	Pearson Education, New Delhi, Latest editon
5.	Data and Computer Communication	Stallings, William	PHI Learning, New Delhi, latest edition

B) List of Major Equipment/ Instrument with Broad Specifications

i. Computer systems
ii. Cables and Connectors
iii. Analog Communication trainer kits
iv. Digital Communication trainer kits
v. Antenna trainer kit, etc.

C) List of Software/Learning Websites

i. http://www.electronics-tutorials.com/
ii. http://www. efymag.com/
iii. gpgbiomedical.hpage.com/
iv. http:// www.nptel.com
v. http:// www.ocw.mit.edu

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. A. K. Bula**, Lecturer,Dept of Instrumentation Engineering, G.P. Gandhinagar
- **Prof. N. D. Makwana**, Lecturer, Dept of Biomedical Engineering, G.P. Gandhinagar
- **Prof. M. H. Dave**, Lecturer ,Dept of Biomedical Engineering, G.P. Gandhinagar
- **Prof. S. S. Malkan**, Lecturer ,Dept of Biomedical Engineering, G.G.P. Ahmedabad

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. (Ms.) Susan S. Mathew**, Associate Professor, Dept. of Electrical and Electronics Engg.
- **Dr. Shailendra Singh**, Professor and Head Dept. of Computer Engineering and Application.