

GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS AND COMMUNICATION ENGINEERING (11) TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS SUBJECT CODE: 2161103 B.E. 6th SEMESTER

Type of course: Departmental Elective-I

Prerequisite: Basic knowledge of microprocessor and microcontrollers. Fundamental knowledge of analog and digital circuits, Analog and digital communication. Analytical skills for communication systems and electronic circuits and mathematical knowledge.

Rationale: Students of EC Engineering need to have good understanding of the fundamentals and application of telecommunication networks i.e. PSTN, PDN and ISDN. Modern digital telecommunication switching and networks. They will be able to understand recent topics like switching systems, time division switching systems, data communication Networks. ISDN, voice data integration and importance of telephone traffic analysis and telephone networks.

Teaching and Examination Scheme:

| Teaching Scheme | | | Credits C | Examination Marks | | | | | | Total Marks |
|-----------------|---|---|--------------|-------------------|-----|---------|-----------------|-----------|----|----------------|
| L | T | P | | Theory Marks | | | Practical Marks | | | |
| | | | ESE (E) | PA (M) | | ESE (V) | | PA (I) | | |
| | | | | PA | ALA | ESE | OEP | | | |
| 3 | 0 | 2 | 5 | 70 | 20 | 10 | 20 | 10 | 20 | 100 |

Content:

| Sr. No. | Content | Total Hrs | % Weightage |
|----------|---|-----------|-------------|
| 1 | Introduction: Evolution of Telecommunications, Simple Telephone Communication, Manual switching system, major telecommunication Networks, Strowger Switching System, Crossbar Switching. | 05 | 10 |
| 2 | Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Enhanced Services, Two stage networks, Three stage network n-stage networks. | 06 | 12 |
| 3 | Time Division Switching: Time multiplexed Space Switching, Time Multiplexed time switching, combination Switching, Three stage combination switching, n-stage combination switching. | 05 | 14 |
| 4 | Traffic Engineering: Network Traffic load and parameters, Grade of service and blocking probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay systems. | 06 | 14 |
| 5 | Telephone Networks: Subscriber Loop Systems, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In channel signaling, common channel signaling, Cellular mobile telephony. | 7 | 16 |

| | | | |
|----------|---|----------|-----------|
| 6 | Data networks: Block Diagram, features, working of EPABX Systems, Data transmission in PSTNs, Data Rates in PSTNs, Modems, Switching Techniques for data Transmission, Circuit Switching, Store and Forward Switching Data communication Architecture, ISO-OSI Reference Model, Link to Link Layers, Physical Layer, Data Link Layer, Network Layer, End to End layers, Transport Layer, Session Layer, Presentation Layer, Satellite based data networks, LAN, Metropolitan Area network, Fiber optic networks, and Data network standards. | 9 | 18 |
| 7 | Integrated Services Digital Networks: Motivation for ISDN, New services, Network and Protocol architecture, Transmission Channels, User Network Interface, signaling, Numbering and Addressing, Service characterization, Interworking ,ISDN standards, Broadband ISDN ,Voice data Integration. | 7 | 16 |

Suggested Specification table with Marks (Theory):

| Distribution of Theory Marks | | | | | |
|-------------------------------------|-----------|-----------|-----------|-----------|-----------|
| R Level | U Level | A Level | N Level | E Level | C Level |
| 10 | 15 | 10 | 15 | 10 | 10 |

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom’s 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.

Reference Books:

1. Thiagarajan Vishwanathan, “Telecommunication Switching Systems and Networks”; PHI Publications.
2. J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education.
3. John C. Bellamy, “Digital Telephony”, Third Edition; Wiley Publications.

Course Outcome:

After completing this course students shall able to:

1. Describe the need for switching systems and their evolution from analogue to digital.
2. Describe the Public Switched Telephone Network.
3. Describe private networks.
4. Describe integrated networks.
5. To compare telephone network, data network and integrated service digital network

List of Experiments:

This shall consist of about 10 Practical’s based on the above syllabus using EPABX Trainer Kit, MATLAB AND SCILAB. Following are the list for example.

1. Study of EPABX System and its features.
2. Perform Basic Switching Systems using MATLAB/SCILAB.
3. Simulation of Time slot interchange algorithm.
4. Simulation of TDMA using MATLAB/SCILAB.
5. To perform digitization of speech signal by writing program in MATLAB/SCILAB.

6. To Perform PCM using MATLAB/SCILAB.
7. Study & Perform sound, speech, Dialer and Key board Matrix section of Telephone.
8. Study & Perform voltage dropper, Line in/Protector and Ringer Section of Telephone.
9. To study and perform TDM PCM.
10. To perform basic Traffic parameters by writing programs in MATLAB/SCILAB.

Design based Problems (DP)/Open Ended Problem:

1. MATLAB/SCILAB implementation to find blocking probability of a two stage and three stage network.
2. MATLAB/SCILAB implementation to find availability and non-availability of single processor and dual processor.
3. MATLAB/SCILAB implementation to find traffic carried per server and group of servers.

Major Equipment: MATLAB/SCILAB, EPABX Trainer.

List of Open Source Software/learning website: www.nptel.ac.in

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.