

As Per NEP 2020

University of Mumbai



Syllabus for Minor Vertical 2

Faculty of Engineering

Board of Studies in Electronics and Telecommunication Engineering

Second Year Programme in Minor – Electronics and Telecommunication Engineering

Semester	IV	
Title of Paper (Theory)	Sem.	Total Credits 4
I) Fundamentals of Telecommunication Systems	IV	3
Title of Paper (Lab)		Credits
I) Basic Telecommunication Experiments	IV	1
From the Academic Year		2025-26

Sem. - IV

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
2304211	Fundamentals of Telecommunication Systems	3	-	-	3	-	-	3

		Theory					Term work	Pract / Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		Test 1	Test 2	Avg.					
2304211	Fundamentals of Telecommunication Systems	20	20	40	60	2	--	--	100

Rationale :

This course introduces the essential principles and components of telecommunication systems, with minimal mathematical complexity, making it accessible to students from diverse academic backgrounds. It equips learners with a foundational understanding of how voice, data, and multimedia communication systems operate—knowledge that is increasingly valuable across sectors such as business, healthcare, education, finance, and public services in today’s digitally connected world.

Course Objectives:

1. Provide foundational knowledge of telecommunication systems, their evolution, and their role in modern society.
2. Introduce the basic principles of signal transmission through different media.
3. Familiarize students with various telecommunication network types and architectures.
4. Explain the working and standards of key telecommunication devices and systems.
5. Introduce students to fundamental digital communication techniques like modulation and multiplexing.
6. Highlight current and emerging trends in telecommunication, such as 5G, IoT, and secure communication.

Course Outcomes:

On successful completion of the course learner will be able to:

1. Describe the evolution and importance of telecommunication systems across various domains.
2. Differentiate between analog and digital signals and identify suitable transmission media.
3. Illustrate the structure and operation of different telecommunication networks and switching methods.
4. Summarize the functionality of major telecommunication devices and associated standards.

5. Explain basic digital communication techniques such as modulation, multiplexing, and error correction.
6. Discuss recent developments in telecommunications, including IoT, 5G, and cloud communication, and relate them to real-world applications.

DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	-	-	-
I	Introduction to Telecommunication	• Evolution of telecommunications • Importance and applications in various industries • Overview of voice, video, and data communication	6	CO1
II	Basics of Signals and Transmission	• Analog vs. Digital signals • Bandwidth and Frequency Spectrum • Transmission media: Wired (Copper, Fiber-optic) and Wireless	6	CO2
III	Telecommunication Networks	• Types of networks: PSTN, Cellular, Satellite, Internet • Network topologies: Star, Mesh, Ring, Hybrid • Overview of Switching and Routing	7	CO3
IV	Telecommunication Devices and Standards	• Telephone, Mobile Phones, Modems • Telecommunication standards (ITU, IEEE, 3GPP) • Basics of 2G, 3G, 4G, and 5G	6	CO4
V	Digital Communication Techniques	• Basic Modulation techniques (AM, FM, PM) • Multiplexing: FDM, TDM • Error detection and correction techniques	7	CO5
VI	Emerging Trends in Telecommunication	• IoT and Smart Communication • 5G, VoIP, and Cloud-based Communication • Cybersecurity and Data Privacy in Telecom	7	CO6

Textbooks:

1. Tomasi, Wayne. *Electronic Communications Systems: Fundamentals Through Advanced*, Pearson.
2. Rappaport, Theodore S. *Wireless Communications: Principles and Practice*, Pearson.

Reference Books:

1. Lathi, B. P. *Modern Digital and Analog Communication Systems*, Oxford University Press.
2. Freeman, Roger. *Telecommunication System Engineering*, Wiley.

Online References:

Sr. No.	Website Name
1.	Swayam: Principles of Communication Systems – I https://onlinecourses.nptel.ac.in/noc22_ee05/preview
2.	Introduction to IoT: https://www.edx.org/learn/iot-internet-of-things/curtin-university-introduction-to-the-internet-of-things-iot
3.	CISCO-Networking Basics: https://www.netacad.com/courses/networking-basics?courseLang=en-US

Assessment:

Internal Assessment (IA) for 20 marks each:

- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of the syllabus content must be covered in the IAT-I and the remaining 40% to 50% of the syllabus content must be covered in the IAT-II.

End Semester Theory Examination:

➤ Question paper format

- Question Paper will comprise a total of **six questions each carrying 15 marks**
Q.1 will be **compulsory** and should **cover the maximum contents of the syllabus**
- **Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from Module 3 then part (b) must be from any other Module randomly selected from all the modules)
- A total of **four questions** need to be answered

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
2304212	Basic Telecommunication Experiments	--	2	--	--	1	--	1

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Practical/ Oral	Total
		Internal assessment			End Sem. Exam			
		Test1	Test 2	Avg. of 2 Tests				
2304212	Basic Telecommunication Experiments	--	--	--	--	25	--	25

Laboratory Objectives:

1. Demonstrate the basic principles of analog and digital communication using hands-on experiments.
2. Introduce students to the use and operation of fundamental communication trainer kits and instruments.
3. Provide practical exposure to signal transmission and reception using modulation and demodulation techniques.
4. Enable students to observe and analyze the behavior of different multiplexing techniques in telecommunication.
5. Familiarize students with telephone and mobile communication basics through interactive experiments.
6. Build student confidence in interpreting real-world telecommunication systems through simulations and physical setups.

Laboratory Outcomes:

After successful completion of the course student will be able to

1. Identify basic telecommunication components and instruments such as signal generators, modulators, and demodulators.
2. Operate trainer kits to perform experiments on amplitude and frequency modulation and demodulation.
3. Demonstrate analog-to-digital and digital-to-analog signal conversions.
4. Simulate digital communication systems using audio or PC-based platforms.
5. Compare the characteristics and performance of FDM and TDM through practical setups.
6. Explain basic mobile and satellite communication setups using lab experiments.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	--	--	--
I	Introduction to Telecommunication Equipment	• Understanding Telephone System and Mobile Networks • Identifying Components: Routers, Switches, Modems	02	CO1
II	Signal Transmission and Reception	• Demonstration of Signal Transmission in Wired and Wireless Media • Analysis of Frequency and Bandwidth	04	CO2
III	Digital and Analog Modulation	• Experiments on AM, FM, and Digital Modulation • Visualizing Modulated Signals on an Oscilloscope	06	CO3
IV	Network Configurations and Communication	• Setting up a simple LAN and understanding IP addressing • Wi-Fi configuration and troubleshooting	06	CO4
V	Data Transmission and Error Handling	• Demonstration of Data Transmission using Serial and Parallel Ports • Experimenting with Error Detection and Correction	04	CO5
VI	Case Study and Industry Applications	• Exploring Telecom Applications in Banking, Healthcare, and E-Commerce • Group Discussions on Future Trends	04	CO6

Reference Books:

1. Frenzel, Louis E. *Principles of Electronic Communication Systems*, McGraw Hill.
2. Stallings, William. *Data and Computer Communications*, Pearson.

List of Experiments:

Week No	List of Experiments	Hrs
01	Study and Operation of a Basic Telephone System.	02
02	Identification and Demonstration of Modem, Router, and Switch Hardware.	02
03	Overview and Demonstration of Mobile Network Components.	02
04	Demonstration of Signal Transmission through Wired Media (Coaxial and Twisted Pair Cable).	02
05	Demonstration of Signal Transmission through Wireless Media (Wi-Fi or Bluetooth).	02
06	Measurement and Analysis of Signal Frequency and Bandwidth using a Spectrum Analyzer.	02

07	Generation and Observation of Amplitude Modulated (AM) Signals.	02
08	Generation and Observation of Frequency Modulated (FM) Signals.	02
09	Digital Modulation Techniques: Generation and Observation of ASK, FSK, and PSK signals	02
10	Comparison of Analog and Digital Modulated Signals using an Oscilloscope.	02
11	Setting up a Basic Local Area Network (LAN) using Switches and Routers.	02
12	Configuration and Testing of IP Addressing in a LAN setup.	02
13	Setup and Configuration of a Wi-Fi Network; Troubleshooting Common Issues.	02
14	Demonstration of Data Transmission using Serial Communication (RS-232 Standard).	02
15	Demonstration of Data Transmission using Parallel Communication Interfaces.	02
16	Implementation and Testing of Error Detection using Parity Checking and Checksums.	02
17	Case Study Presentation: Telecommunication Applications in Healthcare or E-Commerce.	04

Assessment:

Term Work: Term Work shall consist of at least 10 to 13 practicals based on the above list.

Internal Practical Exam: Conduct an internal practical exam after completing the first three modules of the course to assess and ensure the learner's understanding.

Term Work Marks: 25 Marks (Total marks) = 10 Marks (Experiment) + 10 Marks (Internal Practical Exam) + 5 Marks (Attendance)

Sd/-

Dr. Faruk Kazi
BoS-Chairman-
Electronics and Telecommunication
Engineering
Faculty of Technology

Sd/-

Dr. Deven Shah
Associate Dean
Faculty of Science & Technology

Sd/-

Prof. Shivram S. Garje
Dean
Faculty of Science & Technology