

Daffodil Institute of Technology

Diploma-in-Electrical Technology

6th semester

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Technolog⁶⁶⁸⁶⁷

COMMUNICATION ENGINEERING

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AIMS

To provide the students with opportunities to acquire knowledge, skills and attitude in the area of communication engineering with special emphasizes on:

- Various types of modulation demodulation
- Radio receiver and transmitter
- Telephone system
- Digital communication system
- Communication switching system
- Optical fiber communication
- Satellite communication
- Modem and mobile communication

SHORT DESCRIPTION

Communication networks; Modulation; Demodulation Receiver and Transmitter; Telephone system; Digital communication; Communication switching system; Optical fiber; Satellite communication; Digital Communication, Modem and mobile communications.

DETAIL DESCRIPTION

Theory:

- 1 Understand the features of communication network.
 - 1.1 Mention the allocation of frequency bands for various communication systems.
 - 1.2 Explain the nature of Audio, Video, Digital data.
 - 1.3 Explain Channel band width and Channel capacity.
 - 1.4 Describe different types of internal and external noise, noise figure and SNR (signal to noise ratio).
 - 1.5 State the variety of communication networks.
 - 1.6 State the nature of satellite communications.
 - 1.7 Basic communication system with block diagram. 2 Understand the features of modulation.
 - 2.1 Explain the Amplitude Modulation.
 - 2.2 Drive the equation for the amplitude modulated wave.
 - 2.3 Define Modulation index, depth of modulation, SSB, SSB-SC, DSB, DSB-SC and VSB modulation.
 - 2.4 Derive the equation for frequency modulated wave (without analysis of Besel function).
 - 2.5 State the meaning of the terms Modulation index, Maximum frequency deviation and Deviation ratio of FM wave.
 - 2.6 Difference between Amplitude and Frequency modulation.
 - 2.7 Explain the PPM, PDM and PWM signals and describe its application.
 - 2.8 State the principles of Multiplexing and Demultiplexing.
 - 2.9 Explain the principles of FDM and TDM with block diagram.
- 3 Understand the Modulator and Demodulator.
 - 3.1 Explain the principles of operation of Collector modulator, Base modulator, Balanced modulator, Suppressed carrier balanced modulator and Varactor diode modulator (without equation deduction).
 - 3.2 State the basic principles of SSB-SC generation and QAM.
 - 3.3 Mention the methods of AM detection.
 - 3.4 Explain the operation of a Linear (diode) detector.
 - 3.5 Mention the methods of FM detection.
 - 3.6 Explain the working principle of various FM detectors.
 - 3.7 List the advantages of Ratio detector over Foster seely discriminator circuit.

- 4 Understand the features of radio Receiver and Transmitter.
 - 4.1 Explain the block diagram of AM transmitter.
 - 4.2 Explain the operation of SSB transmitter with block diagram.
 - 4.3 Explain the block diagram of Super heterodyne AM receiver with wave form.
 - 4.4 Explain the block diagram of Armstrong system FM transmitter.
 - 4.5 Explain the sensitivity, Selectivity, Fidelity and Signal to Noise Ratio (SNR).

- 5 Understand the features of a telephone system.
 - 5.1 State telephone system.
 - 5.2 Describe the working principle of modern a Modern telephone hand set transmitter and receiver (without deduction of equation).
 - 5.3 Describe the operation of automatic subscriber telephone set.
 - 5.4 Describe advantages & disadvantages of side tone.
 - 5.5 Describe the tones used in automatic telephone.
 - 5.6 Describe about a digital telephone set.
 - 5.7 Define different types of telephone exchange.

- 6 Understand the concept of Digital communication.
 - 6.1 State the advantages of Digital communication.
 - 6.2 Describe the sampling theorem.
 - 6.3 Describe the quantization and coding principle of PCM.
 - 6.4 Mention different types of media used for data transmission.
 - 6.5 Describe the function of line driver and line receiver.
 - 6.6 Describe synchronous and asynchronous mode of data transfer.
 - 6.7 Describe the function of USART. 7 Communication switching system.
 - 7.1 Define communication switching.
 - 7.2 Mention different types of communication switching (analog and digital).
 - 7.3 Functions of switching system.
 - 7.4 Characteristics of switching system.

- 7.5 Describe centralized and distributed stored program (SPC) switching system.
- 7.6 Define the following: Message, Circuit and Packet switching, STS and TST switching.
- 7.7 Mention the different types of cables and connectors.
- 8 Understand Optical Fiber.
- 8.1 Define Optical Fiber.
- 8.2 Basic block diagram of Optical communication system.
- 8.3 Construction of optical fiber.
- 8.4 Advantages and disadvantages of optical fiber.
- 8.5 Mention different types of light sources and detectors of optical fiber.
- 8.6 Describe different types of optical fiber splices. 9 Understand the satellite communication.
- 9.1 Discuss the principles of satellite communication.
- 9.2 Describe the advantages of satellite communication.
- 9.3 Describe satellite earth station with block diagram.
- 9.4 Describe the working principle of VSAT.
- 9.5 Describe the applications of various satellites.
- 9.6 List different locations of satellite earth station in Bangladesh.
- 9.7 Describe the status and features of Bangabandhu Satellite-I.

- 10 Understand the digital communications.
- 10.1 Describe the working principle of Facsimile.
- 10.2 Function of MODEM in data communication.
- 10.3 State the application of digital communication network.
- 10.4 Describe the local area network.
- 10.5 Describe the wide area network.
- 10.6 Describe Ethernet.
- 10.7 Define ISDN, SDH, STN, SONET, FDDI, Internet and WWW, WAP, VOIP.
- 11. Understand the Mobile communications.

- 11.1 State the mobile communication systems.
- 11.2 List the application of mobile communication.
- 11.3 Describe the simple Mobile Network system.
- 11.4 Describe the function of base station of mobile communication system.
- 11.5 Define GSM, CDMA, FDMA, WIMAX, Bluetooth, Wi-fi.
- 11.6 Describe briefly 1G, 2G, 3G, 3.5G, 4G and 5G.

12. Recognize Supervisory Control and Data Acquisition (SCADA) system

- 12.1 Define Supervisory Control and Data Acquisition
- 12.2 Describe General features of SCADA system
- 12.3 Explain Functions and Applications of SCADA Networks
- 12.4 Narrate Structure of a SCADA Communications Protocol
- 12.5 Illustrate a Prototype View of SCADA Systems
- 12.6 SCADA Communication protocols: Past, Present and Future.
- 12.7 Describe Reliability, Redundancy and Safety Issues of SCADA system.

Practical:

- 1 Study the operation of Amplitude modulator.
 - 1.1 Select the required equipment, tools and materials.
 - 1.2 Connect the circuit and equipment.
 - 1.3 Input different modulations and carrier signals.
 - 1.4 Record the required data.
- 1.5 Calculate the modulation index for each set of data. 2 Study the operation of Frequency modulator.
 - 2.1 Select the required equipment, tools and materials.
 - 2.2 Setup the circuit board and the equipment.
 - 2.3 Input the proper signals.
 - 2.4 Make the proper adjustment.

- 2.5 Observe the FM wave.
- 3 Study the operation of Amplitude demodulator.
 - 3.1 Select the required equipment, tools and materials.
 - 3.2 Connect the circuit and equipment.
 - 3.3 Input different modulated signals.
 - 3.4 Observe the output wave.
- 4 Study the operation of Frequency demodulator.
 - 4.1 Select the required equipment, tools and materials.
 - 4.2 Setup the circuit board and the equipment.
 - 4.3 Input the proper signals.
 - 4.4 Make the proper adjustment.
 - 4.5 Observe the output wave.
- 5 Study the Super heterodyne AM radio receiver.
 - 5.1 Select a radio receiver and required tools & materials.
 - 5.2 Identify the circuit diagram of receiver.
 - 5.3 Make the list of the components.
 - 5.4 Trace the circuit of the receiver.
- 6 Study the modern telephone hand set transmitter and receiver.
 - 6.1 Select a modern telephone set.
 - 6.2 Identify the transmitting and receiving section.
 - 6.3 Make a list of components.
- 7 Study the Optical Fiber communication system.
 - 7.1 Select the required equipment, tools and materials.
 - 7.2 Identify the transmitting and receiving section.
 - 7.3 Connect the circuit and equipment.
 - 7.4 Observe the output.
- 8 Study the Optical Fiber joints and couplers.
 - 8.1 Select required tools & materials.

- 8.2 Make Optical Fiber joints.
- 8.3 Test the joint.
- 9 Study the satellite home receiving system.
 - 9.1 Select required tools & materials.
 - 9.2 Connect the satellite receiver with antenna and TV receiver.
 - 9.3 Adjust the channel frequency.
 - 9.4 Observe different channels.
- 11 Field visit for gathering practical experience on SCADA system.
 - 11.1 Make a communication with the authority of PGCB.
 - 11.2 Arrange a field visit.
 - 11.3 Prepare a report on SCADA system.

The student will visit the nearest automatic telephone exchange, digital telephone exchange, Grameen phone network system, Bangladesh Railway, Ground satellite station and VSAT.

REFERENCE BOOKS

1. Introduction to Telecommunication
Marion Cole
2. Mobile Communications
John Schiller
3. Satellite Communications
DC Agarwal
4. Optical Fiber and Fiber Optic Communication system
Subir Kumar Sarker.
5. Mobile and Personal Communication System and Service Raj Pandya.
6. Cellular Mobile system Engineering Saleh Faruque.