Syllabus: Communication Engineering I

Course No: EEE 3117

Department of Electrical and Electronic Engineering
Rajshahi University of Engineering & Technology

Course Content

1. **Overview of Communication Systems**
   - 1.1. Basic principles, Fundamental elements, Message sources, Input-output transducers.
   - 1.2. Transmission policies.
   - 1.3. Analog and digital communication systems, their advantages and disadvantages.
   - 1.4. Introduction to communication networks.
   - 1.5. Communication traffics.
   - 1.6. Telephone communication.
   - 1.7. Satellite communication.
   - 1.8. RADAR communication.
   - 1.9. Fiber optic communication.
   - 1.10. Cellular communication.
   - 1.11. Radio and TV broadcasting.
   - 1.12. Radio switching systems.
   - 1.13. Cognitive radio networks etc.
2. **Transmitter**
   - 2.1. Elements of transmitter and their functions.
   - 2.2. Concept of wireless transmission with antennas.
   - 2.3. Transmit diversity schemes.
   - 2.4. Channel state information at the transmitter.
   - 2.5. Transmission delay.
   - 2.6. **Digitization:**
     - 2.6.1. Sampling and its classification, Sampling theorem, Nyquist criterion, Aliasing effect and its elimination.
     - 2.6.2. Quantizing, Quantization noise, Non-uniform quantization.
     - 2.6.3. Signal to quantization error Ratio.
     - 2.6.4. Encoding, Line coding formats.

2.6.5. Sample and hold circuit.

2.6.6. Quantizer and encoder circuits.

2.7. **Modulation:**

2.7.1. Modulation and its principle, Importance of modulation.

2.7.2. Definition, Graphical representation, Generation.

2.7.3. Modulated signal's expression.

2.7.4. Frequency spectrum and bandwidth requirements of AM, FM and PM.

2.7.5. Design and fabrication of AM, FM and PM transmitter circuits.

3. **Transmission Media**

3.1. Types of media and their properties.

3.2. Principle of information transmission through wire, Coaxial cable, Waveguide, Optical fiber, Radio link etc.

3.3. Channel and its classification.

3.4. PDF, CDF and MGF of channel gain.

3.5. Modeling of fading channels.

3.6. Expressions of received signals.

3.7. Propagation delay.

3.8. Bandwidth.

3.9. Channel capacity and its classification.

3.10. Outage probability.

3.11. Bit error rate, Symbol error rate and their calculations.

4. **Noise**

4.1. Effects of noise on the transmission.

4.2. Sources of noise.

4.3. Characteristics of various types of noise.

4.4. Signal-to-noise ratio.

4.5. Noise figure.

5. **Fading**

5.1. Types of fading.

5.2. Measures of fading channels.

6. **Interference**

6.1. Types of interference and their mitigation techniques.

7. **Correlation**

7.1. Types of correlation and their mitigation technologies.

8. **Digital Link**

   8.1. Design of digital link.

9. **Receiver**

   9.1. Receivers, Elements of receiver and their functions.

   9.2. Superheterodyne receiver.

   9.3. Design and fabrication of matched filter circuit.

   9.4. Analog, Digital and correlator receiver circuits.

   9.5. Receiving antennas.

   9.6. Channel state information at the receiver.

10. **Demodulation and Decoding**

   10.1. Principle of demodulation and decoding.

   10.2. Importance of demodulation.

   10.3. Demodulation and decoding of AM, FM and PM modulated signals.

   10.4. Design and fabrication of AM, FM and PM receiver circuits.