

| Course Code | Course Name          | Teaching Scheme |           |          | Credits Assigned |              |          |       |
|-------------|----------------------|-----------------|-----------|----------|------------------|--------------|----------|-------|
|             |                      | Theory          | Practical | Tutorial | Theory           | TW/Practical | Tutorial | Total |
| ETC502      | Analog Communication | 04              | --        | --       | 04               | --           | --       | 04    |

| Course Code | Course Name          | Examination Scheme  |        |                           |               |   |           |           |      |       |
|-------------|----------------------|---------------------|--------|---------------------------|---------------|---|-----------|-----------|------|-------|
|             |                      | Theory Marks        |        |                           |               |   | Term Work | Practical | Oral | Total |
|             |                      | Internal assessment |        |                           | End Sem. Exam |   |           |           |      |       |
|             |                      | Test 1              | Test 2 | Ave. Of Test 1 and Test 2 |               |   |           |           |      |       |
| ETC502      | Analog Communication | 20                  | 20     | 20                        | 80            | - | -         | -         | 100  |       |

**Course Pre-requisite:-**

- ETC302: Analog Electronics-I
- ETC405: Signals and Systems

**Course Objective:** To teach students

- The fundamentals of basic communication system.
- Various modulation and demodulation techniques used in analog communication, noise handling and multiplexing.
- The working principles of transmitters and receivers used in analog communication systems.

**Course Outcomes:** After successful completion of the course students will able to

- The different modulation and demodulation techniques used in analog communication.
- Identify and solve basic communication problems, analyze transmitter and receivers.
- Detect the errors that occur due to noise during transmission.
- Compare and contrast advantages and limitations of analog communication systems.

| Module No.   | Topics  | Hrs.      |
|--------------|---|-----------|
| 1            | <b>Basics of Communication System</b>   | 04        |
|              | 1.1 Block diagram, electromagnetic spectrum, signal bandwidth and power, types of communication channels  |           |
|              | 1.2 Types of noise, signal to noise ratio, noise figure, and noise temperature  |           |
| 2            | <b>Amplitude Modulation and Demodulation</b>  | 12        |
|              | 2.1 Basic concept, signal representation, need for modulation   |           |
|              | 2.2 Spectrum, waveforms, modulation index, bandwidth, voltage distribution, and power calculation   |           |
|              | 2.3 <b>DSBFC:</b> Principles, modulating circuits, low level and high level transmitters<br><b>DSB suppressed carrier:-</b> Multiplier modulator, nonlinear modulator, and switching modulator,<br><b>Single Side Band (SSB):-</b> Principle, Filter method, phase shift method and third method<br>Quadrature amplitude modulation (QAM), Independent sideband (ISB) and Vestigial Side Band (VSB) principles and transmitters |           |
|              | 2.4 <b>Amplitude demodulation:</b> Diode detector, practical diode detector, and square law detector.   |           |
|              | 2.5 Applications of AM and use of VSB in broadcast television   |           |
| 3            | <b>Angle Modulation and Demodulation</b>  | 14        |
|              | 3.1 <b>Frequency modulation (FM):</b> Basic concept, mathematical analysis, frequency spectrum of FM wave, sensitivity, phase deviation and modulation index, frequency deviation and percent modulated waves, bandwidth requirement of angle modulated waves, deviation ratio, narrow Band FM, and Wide Band FM.   |           |
|              | 3.2 Varactor diode modulator, FET reactance modulator, stabilized reactance modulator-AFC, Direct FM transmitter, indirect FM Transmitter, noise triangle in FM, pre-emphasis and de-emphasis.  |           |
|              | 3.3 <b>Phase modulation (PM):</b> Principle and working of Transistor direct PM modulator and relationship and comparison between FM and PM   |           |
|              | 3.4 <b>FM demodulation:</b> Balance slope detector, Foster-Seely discriminator, ratio detector, Phase lock loop(PLL) FM demodulator, amplitude limiting and thresholding, comparison between FM demodulators, comparison between AM, FM and PM.   |           |
|              | 3.5 Applications of FM and PM   |           |
| 4            | <b>Radio Receivers</b>  | 10        |
|              | 4.1 TRF, Super-heterodyne receiver, receiver parameters, and choice of IF.  |           |
|              | 4.2 AM receiver circuits and analysis, simple AGC, delayed AGC, forward AGC, and communication receiver   |           |
|              | 4.3 FM receiver circuits, comparison with AM receiver   |           |
|              | 4.4 Single and independent sideband (SSB and ISB) receivers   |           |
| 5            | <b>Sampling Techniques</b>  | 04        |
|              | 5.1 Theorem for low pass and band pass signals, proof with spectrum, Nyquist criteria   |           |
|              | 5.2 Sampling techniques, aliasing error, and aperture effect  |           |
| 6            | <b>Pulse Modulation and Demodulation</b>  | 08        |
|              | 6.1 PAM, PWM, PPM generation and detection  |           |
|              | 6.2 Delta modulation, adaptive delta modulation, principle, generation and detection  |           |
|              | 6.3 TDM and FDM basic concepts and block diagram  |           |
|              | 6.4 Applications of pulse communication   |           |
| <b>Total</b> |   | <b>52</b> |

**Recommended Books:**

1. Wayne Tomasi, "*Electronics Communication Systems*", Pearson education, Fifth edition.
2. Kennedy and Davis, "*Electronics Communication System*", Tata McGraw Hill, Fourth edition.
3. B.P. Lathi, Zhi Ding, "*Modern Digital and Analog Communication system*", Oxford University Press, Fourth edition
4. Taub, Schilling and Saha, "*Taub's Principles of Communication systems*", Tata McGraw Hill, Third edition.
5. P. Sing and S.D. Sapre, "*Communication Systems: Analog and Digital*", Tata McGraw Hill, Third edition.
6. Simon Haykin, Michel Moher, "*Introduction to Analog and Digital Communication*", Wiley, Second edition.
7. Dennis Roddy and John Coolen, "*Electronic Communication*", Prentice Hall, Third Edition.

**Internal Assessment (IA):**

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of two tests should be considered as final IA marks

**End Semester Examination:**

1. Question paper will comprise of 6 questions, each of 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions for 2 to 5 marks will be asked.
4. Remaining questions will be selected from all the modules.