

## Faculty of Engineering & Technology

### Communication 1

#### Information :

**Course Code :** COM 411

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Electronics & Communication

#### Instructor Information :

| Title               | Name                                | Office hours |
|---------------------|-------------------------------------|--------------|
| Associate Professor | KAMEL MOHAMED MAHMOUD HASSAN        | 4            |
| Teaching Assistant  | Samar Abdelmohaimen Mohamed Soliman |              |

#### Area Of Study :

- Develop the students' knowledge about communication theory.
- Develop the students' knowledge about the function of each basic element of analog communication system and its fundamental limits.
- Prepare students to analyze, design and/or evaluate communication schemes.
- Train students to perform basic experiments on communication systems & sub-systems.

#### Description :

History of communication, Communication systems: block diagram, transmission media, frequency bands, fundamental limits, Shannon, s equation, linear and nonlinear distortion, noise (internal and external noise sources). Energy and power spectral densities. Amplitude modulation (conventional AM, SSB, DSB and VSB) and demodulation, Angle modulation and demodulation (PM and FM), Automatic gain control, Automatic frequency control, FDM Systems, Broadcast transmitters and receivers (AM SSB and FM) and circuits (Detectors, Mixers, Automatic gain control, Automatic frequency control, Phase-locked-loop, Applications of class C RF power amplifiers: limiters, harmonic generators and amplitude modulators, FM stereo broadcast transmitters and receivers

#### Course outcomes :

##### **a.Knowledge and Understanding: :**

|     |   |
|-----|---|
| 1 - | Memorize the technical terminology in communication engineering   |
| 2 - | Explain the basic elements of a communication system.   |
| 3 - | Classify different types of analogue modulation techniques in communication systems.                        |
| 4 - | Explain different types of amplitude and frequency modulation and their applications in radio transceivers. |
| 5 - | Explain coherent and non-coherent detection methods in communication systems.                               |

##### **b.Intellectual Skills: :**

|     |  |
|-----|--|
| 1 - | Manage the power budget for guided and unguided communication channels.  |
| 2 - | Analyze channel performance in communication systems in terms of noise and channel capacity.   |
| 3 - | Develop the calculations of the PSD, ESD, the essential BW of an energy signal, and the input-output power relationship of a communication system. |
| 4 - | Develop the basic calculations for AM and FM signals.  |

|  |  |
|--|--|
| 5 -  | Compare different types of modulation techniques.  |
| <b>c. Professional and Practical Skills: :</b> |  |
| 1 -  | Formulate data and requirements for designing a simple analog communication system.            |
| 2 -  | Able to choose the appropriate modulation technique for a certain application                  |
| 3 -  | Develop the appropriate scheme to measure the main parameters of analog communication systems. |
| 4 -  | Validate the performance of radio receivers and radio transmitters.                            |
| 5 -  | Practice basic experiments on communication systems  |
| <b>d. General and Transferable Skills: :</b>   |  |
| 1 -  | Collaborate effectively within multidisciplinary team.   |
| 2 -  | Work in stressful environment and within constraints.  |
| 3 -  | Communicate effectively  |
| 4 -  | Effectively manage tasks, time, and resources.   |

| <b>Course Topic And Contents :</b>   |                     |                |                             |
|--|---------------------|----------------|-----------------------------|
| <b>Topic</b>   | <b>No. of hours</b> | <b>Lecture</b> | <b>Tutorial / Practical</b> |
| Communication History, basic definitions, Elements of comm. system.  | 5                   | 3              | 2                           |
| Contaminations: 1. Attenuation (guided & Unguided Channels)<br>2. Distortion, 3. Interference, and 4. Noise.   | 5                   | 3              | 2                           |
| Shannon and Hartly Theorem<br>Noise sources (Internal & External). Linear Distortion   | 5                   | 3              | 2                           |
| Linear Distortion: Distortion-less Transmission, Equalization, Multipath effect. Fading. Nonlinear distortion  | 10                  | 6              | 4                           |
| Energy Spectral Density (ESD), Power spectral Density (PSD)  | 5                   | 3              | 2                           |
| Amplitude Modulation. DSB-SC, generation methods, basic Equations, Detection, methods. DSB-FC, generation and detection Basic equations and measurements.  | 10                  | 6              | 4                           |
| SSB-SC. Basic Equations, Hilbert Transform Generation: Filtering method, NL modulator, and phasing method. DSB-FC  | 10                  | 6              | 4                           |
| AM Radio Transmitters:<br>Block diagram, Main Specs.<br>Measurements of Main Specs   | 5                   | 3              | 2                           |
| AM Radio Receiver<br>Block diagram, Main Specs<br>Measurements of Main Specs   | 5                   | 3              | 2                           |
| Angle Modulation<br>Main concept of instantaneous frequency.<br>BW of FM signal {Carson's Rule. Generation of FM signal {Direct and Indirect methods, Demodulation of FM signal}. Interference of Angle modulation. Pre-emphasis, and De-emphasis in FM Broadcasting<br>FM Receiver.<br>Measurements of Main Specs | 10                  | 6              | 4                           |

**Course Topic And Contents :**

| Topic                                  | No. of hours | Lecture | Tutorial / Practical |
|--|--------------|---------|----------------------|
| Course Project & Technical Assignments | 5            | 3       | 2                    |

**Teaching And Learning Methodologies :**

|                        |
|------------------------|
| Interactive Lecturing  |
| Problem Solving.       |
| Experiential Learning. |
| Site Visit.            |
| Research               |
| Discussion             |
| Project                |
| Cooperative Learning   |

**Course Assessment :**

| Methods of assessment | Relative weight % | Week No | Assess What |
|-----------------------|-------------------|---------|-------------|
| Assignments           | 10.00             |         |             |
| Final exam            | 40.00             |         |             |
| Lab test              | 10.00             |         |             |
| Mid- Exam I           | 15.00             |         |             |
| Mid- Exam II          | 15.00             |         |             |
| Quizzes               | 10.00             |         |             |