



**KSSEM**  
K S SCHOOL OF ENGINEERING AND MANAGEMENT

KammavariSangham (R) 1952

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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

## Technical Talk Report on

### Modulation systems in mobile Communication:1G to 5G

**Event name:** Technical Talk

**Topic:** Modulation systems in mobile Communication: 1G to 5G

**Date of event:** 30<sup>th</sup> August, 2023

**Venue:** Civil Auditorium, KSSEM

**Number of participants:** 125

**Targeted Audience:** 2<sup>nd</sup> year ECE students

The department of Electronics and Communication Engineering, KSSEM, had organized a technical talk on, “**Modulation systems in mobile Communication: 1G to 5G**” on 30<sup>th</sup> August, 2023 at 1:20PM IST.

The talk was delivered by Mr. Sasindran M Prabhu. Dr.K Senthil Babu, HoD of ECE, graced the event with his presence. The seminar was attended by both faculty members and students.

The objective of the technical talk was to prepare the students about necessity for using wires in the communication systems.

#### **Abstract:**

Modulation is a fundamental technique in wireless cellular communication systems that enables the transmission of data over radio waves. This report presents an overview of modulation techniques employed in mobile communication systems from the first generation (1G) to the fifth generation (5G), tracing their evolution, types, and impact on wireless communication. Additionally, the report discusses the transformation of cellular networks and the introduction of an all-IP architecture in 4G systems.



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## **Introduction:**

Mobile communication systems have undergone significant evolution over generations, driven by the need for improved data rates, reduced latency, and enhanced network efficiency. Modulation techniques, which encode data into radio signals for transmission, play a central role in this evolution.

## **Types of Modulation Techniques:**

Modulation techniques fall into two broad categories: analog and digital.

### **Analog Modulation:**

Analog modulation techniques, used in the 1G era, include Frequency Modulation (FM) and Amplitude Modulation (AM). These techniques involve varying the frequency or amplitude of carrier signals to encode information. However, analog modulation is susceptible to noise and interference, limiting data capacity.

### **Digital Modulation:**

Digital modulation techniques introduced with 2G and onwards, involve converting digital data into discrete symbols before transmission. Some key digital modulation schemes include:

**Frequency Shift Keying (FSK):** Used in 2G systems, FSK encodes data by varying the carrier frequency between two distinct values.

**Gaussian Minimum Shift Keying (GMSK):** A form of Continuous Phase Frequency Shift Keying (CPFSK), used in 2G, which offers improved spectral efficiency compared to FSK.

**Quadrature Phase Shift Keying (QPSK):** Employed in 3G, QPSK encodes data by varying both the amplitude and phase of the carrier.

**Quadrature Amplitude Modulation (QAM):** Used in 3G and beyond, QAM combines both amplitude and phase variations for higher data rates.

## **Evolution of Mobile Communication:**

**Analog Modulation:** The first-generation (1G) systems, primarily using analog modulation techniques like Frequency Division Multiple Access (FDMA), provided limited data rates of around 2 kbps.



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**Digital Modulation:** The second generation (2G) introduced digital modulation techniques, such as Time Division Multiple Access (TDMA) and Code Division Multiple Access (CDMA), enhancing data rates to 14.4 to 64 kbps.

#### **Wireless Cellular Communication System:**

Wireless cellular communication systems are designed as a network of interconnected cells, each served by a base station. As generations progressed, the density of cells increased to provide higher coverage and capacity. The evolution led to smaller cell sizes, reduced interference, and improved network reliability.

#### **Transition to All-IP Architecture:**

The transition to 4G brought about a paradigm shift with the adoption of an all-IP architecture. This architecture facilitated seamless integration of voice and data services over a unified network, improving efficiency and allowing for a wider range of services and applications.

#### **Conclusion:**

Modulation techniques have been at the forefront of mobile communication evolution, transforming the way data is transmitted and received. From the analog modulation of 1G to the advanced modulation schemes of 5G, each generation has brought about higher data rates, improved spectral efficiency, and enhanced user experiences.

The shift towards an all-IP architecture in 4G further revolutionized the cellular landscape. As 5G continues to unfold, modulation systems remain a pivotal element in shaping the future of wireless communication.

At the end of the technical seminar students were given multiple choice questions based on the session and evaluated the performance of the students.



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## Photo Gallery:

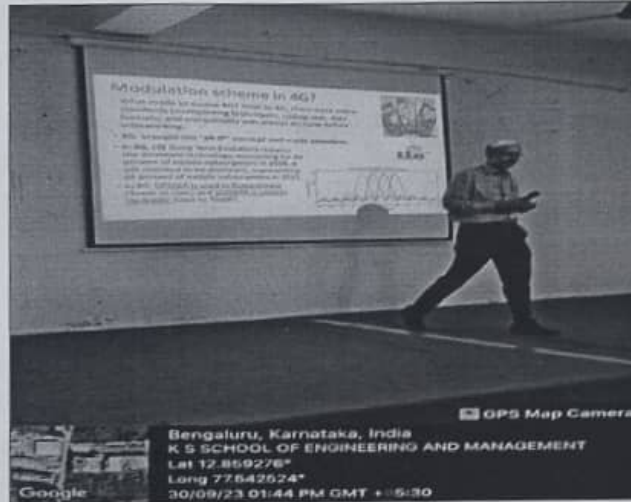

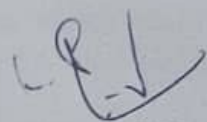


Fig 1. Speaker addressing the Audience



Fig 2. Students Participants in the Event

  
Co-ordinator

  
Signature of HOD, ECE

Professor & Head  
Dept. of Electronics & Communication Engineering  
K.S. School of Engineering & Management  
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