## SEMESTER S7

## COMMUNICATION TECHNIQUES

| Course Code | PEEBT751 | CIE Marks | 40 |
|---|---|---|---|
| Teaching Hours/Week (L: T:P: R) | 3:0:0:0 | ESE Marks | 60 |
| Credits | 3 | Exam Hours | 2 Hrs. 30 Min. |
| Prerequisites (if any) | NIL | Course Type | Theory |

**Course Objectives:**

1. Develop a comprehensive understanding of both analog and digital communication systems, including fundamental principles, modulation techniques, and key components of advanced communication systems like microwave, satellite, and optical communications.
2. Gain proficiency in digital modulation schemes, understand the evolution of mobile communication technologies from 1G to 5G, and learn about modern wireless communication systems and multiple access techniques.

## SYLLABUS

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| Module No. | Syllabus Description | Contact Hours |
|---|---|---|
| 1 | **Introduction to communication systems:** Definition, Block level representation. Analog and digital communication systems: Comparison, Need for modulation **Amplitude Modulation:** Representation of AM, Modulation index, Frequency spectrum, Power relations in AM wave, AM Generation, Envelope AM Detection, Superheterodyne AM receiver, Balanced modulator **Frequency modulation:** Mathematical representation, waveforms, frequency deviation, bandwidth requirement, FM Generation– Varactor Diode Modulator & Armstrong method, Pre-emphasis and De-emphasis, Balanced slope detector, FM transmitters and FM receivers (block diagram) | 9 |
| 2 | **Pulse Modulation:** Need for pulse modulation, Different types, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation and Pulse Code Modulation – principles of operation. **Digital Modulation Schemes**: BPSK, QPSK, BFSK, Differential Phase Shift Keying (DPSK), QAM. Modems: Classification, Modes of operation, Modem interfacing | 9 |
| 3 | **Microwave communication system:** Introduction- transmitter- repeater- | 9 |

| | | |
|---|---|---|
| | receiver, frequency bands. Satellite communication system: Introduction- transponder, Kepler's laws, Satellite sub systems. **Optical communication system**: Features: fiber optic technology- total internal reflection- Snell's law- light transmission through an optical fiber- numerical aperture, Optical fiber communication system. **Cellular communications:** Principles of cellular networks, frequency reuse, operation of cellular system, hand off strategies, roaming, improving capacity in cellular system. | |
| **4** | **Wireless communication systems:** Introduction to modern wireless communication systems, Wireless local area networks, Bluetooth and Personal Area networks. **Introduction to Multiple Access:** FDMA, TDMA, Spread Spectrum Multiple Access, Space division Multiple Access, CDMA, OFDM. GSM services, architecture of GSM network. Overview of Mobile Communication Generations (1G to 4G), Evolution and Need for 5G, 5G Network Architecture and Components | **9** |

**Course Assessment Method**
**(CIE: 40 marks, ESE: 60 marks)**

**Continuous Internal Evaluation Marks (CIE):**

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| Attendance | Assignment/ Microproject | Internal Examination-1 (Written) | Internal Examination- 2 (Written) | Total |
|---|---|---|---|---|
| **5** | **15** | **10** | **10** | **40** |

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

| Part A | Part B | Total |
|---|---|---|
| • 2 Questions from each module.<br>• Total of 8 Questions, each carrying 3 marks<br>**(8x3 =24marks)** | • Each question carries 9 marks.<br>• Two questions will be given from each module, out of which 1 question should be answered.<br>• Each question can have a maximum of 3 sub divisions.<br>**(4x9 = 36 marks)** | **60** |

## Course Outcomes (COs)

At the end of the course students should be able to:

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Develop a thorough understanding of the fundamental principles and concepts of both analog and digital communication systems, including the necessity and differences of various modulation techniques. | **K4** |
| **CO2** | Gain proficiency in various digital modulation schemes such as BPSK, QPSK, BFSK, DPSK, and QAM, and understand modem classification and interfacing. | **K3** |
| **CO3** | Explore the key components and functioning of advanced communication systems, including microwave, satellite, optical communication systems, and principles of cellular communications. | **K2** |
| **CO4** | understand the evolution of mobile communication technologies from 1G to 4G, understand the need for and architecture of 5G networks, and learn about modern wireless communication systems and multiple access techniques. | **K2** |

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

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**CO-PO Mapping Table:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 1 | - | 1 | - | - | - | 1 | - | 3 |
| **CO2** | 3 | 3 | 2 | 1 | - | 1 | - | - | - | 1 | - | 3 |
| **CO3** | 3 | 3 | 2 | 1 | - | 1 | - | - | - | 1 | - | 3 |
| **CO4** | 3 | 3 | 2 | 1 | - | 1 | - | - | - | 1 | - | 3 |
| **CO5** | 3 | 3 | 3 | 1 | - | 1 | - | - | - | 1 | - | 3 |

| Text Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Analog Communication Systems | Dr. Sanjay Sharma | Katson Books | 2009 |
| **2** | Communication Systems (Analog and Digital) | Dr. Sanjay Sharma | Katson Books | 2009 |
| **3** | Advanced Electronic Communication Systems | Tomasi | Pearson | 6th Edition, 2015 |
| **4** | Wireless Communications and Networks | Mishra | McGraw Hill | 2nd Edition, 2013 |
| **5** | 5G Mobile and Wireless Communications Technology | Afif Osseiran, Jose F. Monserrat, Patrick Marsch | Cambridge University Press | 2016 |

| Reference Books | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | Electronic Communication | Dennis Roody and John Coolen | Prentice Hall of India, New Delhi | 4th edition |
| **2** | Electronic Communication Systems | George Kennedy & Davis | Tata McGraw Hill | 6th Edition |
| **3** | Digital and Analog Communication Systems | Sam Shanmugham | John Wiley & Sons | August 2006 |
| **4** | Modern Wireless Communication | Simon Haykin, Michael Mohar | Pearson Education | 2005 |
| **5** | Satellite Communication | Dennis Roody | McGraw Hill | 4th Edition |

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| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://onlinecourses.nptel.ac.in/noc21_ee11 |
| **2** | https://onlinecourses.nptel.ac.in/noc21_ee74 |
| **3** | https://onlinecourses.nptel.ac.in/noc22_ee85 |