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|---|---|---|---|---|
| **Data Communications** | **3** | **1** | **0** | Mathematics, Physics |

**Course Objective**: 1. To understand various key components for data communication systems.
2.To familiarize with the mathematical and physical principles of digital transmission techniques.
3. To understand and differentiate among various data communication techniques and devices.

| S. NO. | Course Outcomes (CO) |
|---|---|
| **CO1** | Understand the fundamental concepts and application of data communications |
| **CO2** | Develop a comprehensive understanding of fundamental data communication concepts, digital transmission techniques,data representation, synchronization and multiplexing. |
| **CO3** | Acquaint the principles of modulation process for different digital modulation systems. |
| **CO4** | Learn to evaluate working of waveform coding techniques and analyse their performance |
| **CO5** | Develop the understanding of design issues of digital communication channels, switching systems and devices |

| S. NO. | Contents | Contact Hours |
|---|---|---|

| | | |
|---|---|---|
| **UNIT 1** | Introduction to Data Communication: Definition, Characteristics & Components of Data Communication System. Data Representation, types of Communication and data transmission modes. Synchronous and Asynchronous Transmission. Communication model, Sender, Receiver, Carrier and data flow. | **10** |
| **UNIT 2** | Data and signals : Analog and Digital data & signals. Periodic and nonperiodic signals. Phase, wavelength, time and frequency domains.Concept of bandwidth. Bit rate, bit length, transmission of digital signals. Impairments, attenuation, distortion, noise. Data rate limits, bandwidth, throughput, latency (delay), bandwidth-delay product & jitter. | **10** |
| **UNIT 3** | Digital Transmission: Analog to digital and digital to digital conversion .Line Coding, Line Coding Schemes, Block Coding, Scrambling. Digital Modulataion techniques , Pulse Code Modulation (PCM) and Delta Modulation (DM). Parallel and Serial Transmission, Bandwidth Utilization-Multiplexing and Spreading: | **10** |
| **UNIT 4** | Transmission media & Physical layer: Guided media: twisted-pair cable, coaxial cable, fiber-optic cable. Unguided media-wireless: radio waves, microwaves infrared. Performance comparison of Wired and Wireless Media. Physical Layer Specifications, Signaling, and network devices at Physical Layer | **8** |
| **UNIT 5** | Introduction of Switching Networks: Switching Methods and devices, access points, hubs , routers , gateways. Comparison of, Circuit, Packet Switching datagram and Virtual circuit switching . Structure of Switch. | **4** |
| | **TOTAL** | **42** |

| **REFERENCES** | | |
|---|---|---|
| **S.No.** | **Name of Books/Authors/Publishers** | **Year of Publication / Reprint** |
| **1** | Data Communications and Networking , 6th Edition by Behrouz A. Forouzan ,Tata McGraw-Hill | 2022 |
| **2** | Data and Computer Communications, 10th Edition by Stallings William, Pearson Higher Ed Publication | 2017 |
| **3** | Computer Networks 6th Edition by Andrew S. Tanenbaum, Pearson Higher Ed Publication | 2022 |
| **4** | Communication Systems, Fourth Edition, Simon Haykin, — John Wiley & Sons. | 2006 |

| **B.Tech. Information Technology** | | | | |
|---|---|---|---|---|
| **Course code: Course Title** | **Course Structure** | | | **Pre-Requisite** |
| **Principles of Computing** | **L** | **T** | **P** | Elementary set theory, Relations, Mappings, and linear algebra |
| | **3** | **1** | **0** | |

**Course Objective:** To provide knowledge and skills in theoretical foundations of computing that are needed to study and practice computer science.

| **S. NO** | **Course Outcomes (CO)** |
|---|---|
| **CO1** | Ability to understand the basic scientific principles of computing. |
| **CO2** | Ability to analyze, evaluate and conduct membership tests for grammars belonging to different formal languages. |
| **CO3** | Ability to design automata for a given language. |

| | |
|---|---|
| **CO4** | Ability to construct accepting and computing Turing Machines for a given language. |
| **CO5** | Ability to understand, analyze and evaluate complexity, reducibility, decidability, undecidability. |

| S. NO | Contents | Contact Hours |
|---|---|---|
| **UNIT 1** | Introduction to Computing: The scientific foundations of computing, Proof techniques and fundamentals, Concepts of soundness and completeness. | **8** |
| **UNIT 2** | Formal languages: Chomsky heirarchy of grammars, Regular grammars and languages, Context-free grammars and languages, Context-sensitive grammars and languages, Pumping lemma, Closure properties. | **8** |
| **UNIT 3** | Automata theory: Finite automata (NFA and DFA), Push-Down automata, Linear Bounded Automata, Equivalance of automata. | **8** |
| **UNIT 4** | Turing machines: Church Turing Thesis, Computing and accepting Turing Machines, Turing Machine Construction, Variants of Turing Machine, Recursive and recursively enumerable languages, Decidability and Undecidability, Universal Turing Machine, Halting problem. | **10** |
| **UNIT 5** | Computational complexity: Time complexity, Measuring complexity, P and NP classes, Co-NP and NP-Completeness, Problem reduction, Polynomial hierarchy and Hierarchy theorem, Space complexity and Savich's theorem, Log-space reducibility. | **8** |
| | **TOTAL** | **42** |

**REFERENCES**


| S.No. | Name of Books/Authors/Publishers | Year of Publication / Reprint |
|---|---|---|
| **1** | Hopcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education. ISBN-13: 978-0321455369 | 2006 |
| **2** | K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science Automata, Languages and Computation”, PHI, ISBN-10: 8120329686 | 2007 |
| **3** | Grimaldi, Ralph P., "Discrete and Combinatorial Mathematics" Pearson Education. | 2006 |
| **4** | Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI, ISBN-13:978-0132624787 | 1998 |