# SRM University – AP, Andhra Pradesh

Neerukonda, Mangalagiri Mandal

Guntur District, Mangalagiri, Andhra Pradesh 522240

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**Computer Networks**

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|---|---|---|---|---|---|---|---|---|
| **Course Code** | CSE 301 | **Course Category** | Core Course (CC) | **L-T-P-C** | 3 | 0 | 1 | 4 |
| **Pre-Requisite Course(s)** | | **Co-Requisite Course(s)** | | **Progressive Course(s)** | | | | |
| **Course Offering Department** | CSE | **Professional / Licensing Standards** | | | | | | |

**Course Objectives / Course Learning Rationales (CLRs)**

**Objective 1:** Understand the computer networking fundamentals with data communication system, TCP/IP and OSI reference mode.

**Objective 2:** Analyse the requirements for a given organizational structure and selection of appropriate network architecture and topology.

**Objective 3:** Specify and identify working limitation in existing protocols of networking layers and try to formulate new and better protocols.

**Objective 4:** Gain knowledge of services and design issues of Transport layer. Also compare and contrast TCP and UDP protocol.

**Course Outcomes / Course Learning Outcomes (CLOs)**

| | **At the end of the course the learner will be able to** | **Bloom's Level** | **Expected Proficiency Percentage** | **Expected Attainment Percentage** |
|---|---|---|---|---|
| **Outcome 1** | Describe computer networking fundamentals based on data communication system, TCP/IP and OSI reference model | 2 | 70 % | 65% |
| **Outcome 2** | Demonstrate error control and flow control techniques at data link layer | 3 | 70 % | 65% |

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| **Outcome 3** | Select the routing protocols for wired and wireless networks | 3 | 70 % | 65% |
| **Outcome 4** | Implement ECN congestion and flow control transport layer protocols | 3 | 70 % | 65% |
| **Outcome 5** | Compare and Contrast application layer protocols -FTP, HTTP, SMTP | 4 | 70 % | 65% |

**Course Unitization Plan - Theory**

| Unit No. | Unit Name | Required Contact Hours | CLOs Addressed | References Used |
|---|---|---|---|---|
| 1 | Introduction | 9 | | |
| | Basic Computer Network concepts, Protocol, Layering Scenario. | 1 | 1 | 1,2 |
| | Layer Architecture: OSI Model, TCP/IP model. | 1 | 1 | 1 |
| | Internet history standards and administration; Comparison of the OSI and TCP/IP reference model. | 1 | 1 | 1,2 |
| | Guided transmission media, wireless transmission media. | 1 | 1 | 1 |
| | Different LAN topologies: BUS, RING and STAR topology. | 1 | 1 | 1 |
| | Data Link layer design issues: Error detection techniques. | 1 | 1 | 1 |
| | Error Correction Techniques, Flow control. | 1 | 1 | 1,2 |
| | Sliding Window protocols. Go back N and selective Repeat protocols. | 1 | 1 | 1,2 |

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| | Difference between single bit sliding window and n-bit sliding window protocols. | 1 | 1 | 1,2 |
| 2 | Medium Access Control | 9 | | |
| | Static and Dynamic channel Allocations. | 1 | 2 | 1,2 |
| | Shared channel Access: Pure ALOHA and slotted ALOHA. | 1 | 2 | 1,2 |
| | Persistent CSMA protocols: 1,P and Non-persistent CSMA protocols. | 1 | 2 | 1,2 |
| | CSMA with collision detection. Comparison of different CSMA protocols. | 1 | 2 | 1,2 |
| | Collision free protocols: Bit-map protocol, Token Ring and Binary Count down protocols. | 1 | 2 | 1,2 |
| | Limited Contention protocols: Adaptive tree walk protocol. | 1 | 2 | 1,2 |
| | Shared medium for wireless networks: CSMA/CA or MACA. | 1 | 2 | 1,2 |
| | Interconnecting LANs: HUBS, Repeaters and Switches and bridges. | 1 | 2 | 1,2 |
| | Spanning tree algorithm for bridges. | 1 | 2 | 1,2 |
| 3 | Network Layer | 9 | | |
| | Overview: Connection oriented and connection less services. | 1 | 3 | 1,2 |
| | Comparison of packet switched, and circuit switched networks. | 1 | 3 | 1,2 |
| | Routing: proactive routing and reactive routing protocols, static and dynamic routing protocols. | 1 | 3 | 1,2 |
| | Dijkstra Algorithm, Distance vector routing and Link state routing protocols. | 1 | 3 | 1,2 |
| | Routing in wireless networks: AODV and DSR routing protocols. | 1 | 3 | 1,2 |

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| | Overview of IP header and IP addressing. | 1 | 3 | 1,2 |
| | Classful IP addressing: Class A, B,C,D and E. | 1 | 3 | 1,2 |
| | Limitations of classful Addressing, Introduction to Subnet. | 1 | 3 | 1,2 |
| | Overview of Congestion: Warning Bit, Choke packets, Load Shedding, RED (Random Early Detection) | 1 | 3 | 1,2 |
| 4 | Internetworking and Transport layer | 7 | | |
| | IP Encapsulation and Tunnelling. | 1 | 4 | 1 |
| | IP packet fragmentation, ICMP, ARP. | 1 | 4 | 1 |
| | ICMP, DHCP, Introduction to Transport layer. | 1 | 4 | 1 |
| | Different end-to-end transport layer protocols: TCP and UDP. | 1 | 4 | 1 |
| | Brief explanation of TCP protocol. | 1 | 4 | 1 |
| | Brief explanation of UDP protocol. | 1 | 4 | 1 |
| | Packet formats for TCP and UDP protocol. | 1 | 4 | 1 |
| 5 | Transport and Application protocols | 11 | | |
| | TCP Connection Management Modelling. | 1 | 5 | 1 |
| | TCP Sliding Window. | 1 | 5 | 1 |
| | TCP congestion control. | 1 | 5 | 1 |
| | Introduction to application layer paradigms. | 1 | 5 | 1 |
| | Client Server model. | 1 | 5 | 1 |
| | Introduction and overview of HTTP protocol. | 1 | 5 | 1 |
| | Overview of FTP protocol. | 1 | 5 | 1 |
| | Operation of Electronic Mail. | 1 | 5 | 1 |
| | Introduction to peer-to-peer communication models. | 1 | 5 | 1 |
| | Introduction and overview of TELNET. | 1 | 5 | 1 |

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| | Importance of Security in computer Networks. | 1 | 5 | 1 |
| Total Contact Hours | | 45 | | |

**Objective: The objective of computer networks is to create an interconnected environment where resources and information can be shared efficiently, securely, and reliably, thereby enhancing communication, collaboration, and overall productivity.**

**Course Unitization Plan - Lab**

| Exp No. | Experiment Name | Required Contact Hours | CLOs Addressed | References Used |
|---|---|---|---|---|
| | Lab Experiment 1: Using Wireshark, for sniffing network traffic in real-time and analyse the packet contents--traffic analysis. | 2 | 3 | 2 |
| | Lab Experiment 2: Simulate error detection technique using CRC Algorithm. | 2 | 3 | 2 |
| | Lab Experiment 3: Write a program to implement error correction technique using Hamming code. | 2 | 3 | 2 |
| | Lab Experiment 4: Write a program to implement 1-bit Stop and Wait Protocol at data link layer. | 2 | 3 | 2 |
| | Lab Experiment 5: Simulate N-bit Sliding Window protocol, at data link layer. | 2 | 3 | 2 |

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| | Lab Experiment 6: Write a program to implement Dijkstra Shortest path routing protocol | 2 | 3 | 2 |
| | Lab Experiment 7: Write a program to implement Distance Vector Routing. | 2 | 3 | 2 |
| | Lab Experiment 8: Demonstrate TCP Client Server paradigm through simulation | 2 | 3 | 2 |
| | Lab Experiment 9: Demonstrate UDP Client Server paradigm through simulation. | 2 | 3 | 2 |
| | Lab Experiment 10: Write a program to implement echo command in client server socket programming. | 2 | 3 | 2 |
| | Lab Experiment 11: Write a program to simulate Trace-route command. | 2 | 3 | 2 |
| | Lab Experiment 12: Demonstrate the implementation of Ping command | 2 | 3 | 2 |
| | Lab Experiment 13: Write a code to display the class of IP address, network mask and generate the subnet IP address based on the subnet bits entered from the keyboard | 2 | 3 | 2 |
| | Lab Experiment 14: Write a code to implement sliding window protocol at the transport layer | 2 | 3 | 2 |
| | Lab Experiment 15: Simulate transfer file operation using TCP | 2 | 3 | 2 |
| Total Contact Hours | | 30 | | |

**Recommended Resources**


1. Tanenbaum, A. S. (2011). Computer Networks , 5th Edition, Pearson Education.
2. Forouzan, B. A. (2013). Data Communications and Networking, 5th Edition TMH.


**Other Resources**


1. Kurose, J. K., & Ross, K. W. (2017). Computer Networking: A Top-Down Approach Featuring the Internet, 7th Edition, Pearson Education.

2. Shay, W. A. (2003). Understanding communications and Networks, 3rd Edition, Cengage Learning

**Learning Assessment (Theory)**

| Bloom's Level of Cognitive Task | | Continuous Learning Assessments (30%) | | | | End Semester Exam (30%) |
|---|---|---|---|---|---|---|
| | | CLA-1 (10%) | Mid-1 (10%) | CLA-2 (5%) | CLA-3 (5%) | |
| Level 1 | Remember | 70% | 60% | 30% | 30% | 60% |
| | Understand | | | | | |
| Level 2 | Apply | 30% | 40% | 70% | 70% | 40% |
| | Analyse | | | | | |
| Level 3 | Evaluate | | | | | |
| | Create | | | | | |
| **Total** | | **100%** | **100%** | **100%** | **100%** | **100%** |

**Learning Assessment (Lab)**

| Bloom's Level of Cognitive Task | | Continuous Learning Assessments (20%) | | End Semester Exam (20%) |
|---|---|---|---|---|
| | | Lab Record (5%) | Lab Performance (15%) | |
| Level 1 | Remember | 50% | 50% | 50% |
| | Understand | | | |
| Level 2 | Apply | 50% | 50% | 50% |
| | Analyse | | | |
| Level 3 | Evaluate | | | |

| | | | | |
|---|---|---|---|---|
| | Create | | | |
| **Total** | | **100%** | **100%** | **100%** |