## PARVATHANENI BRAHMAYYA
## SIDDHARTHA COLLEGE OF ARTS & SCIENCE
*Autonomous*
Siddhartha Nagar, Vijayawada–520010
*Re-accredited at 'A+' by the NAAC*

| Course Code | | 23CGMAL234 | | | | | |
|---|---|---|---|---|---|---|---|
| Title of the Course | | COMPUTER NETWORKS | | | | | |
| Offered to: (Programme/s) | | B.Sc Hons. (CSCS) | | | | | |
| L | 4 | T | 0 | P | 0 | C | 3 |
| Year of Introduction: | | 2024-25 | Semester: | | | | 3 |
| Course Category: | | Major Theory | Course Relates to: | | Global / National / Regional / Local | | |
| Year of Revision: | | | Percentage: | | - | | |
| Type of the Course: | | Skill Development / Employability | | | | | |
| Crosscutting Issues of the Course: | | | | | | | |
| Pre-requisites, if any | | Computer Fundamentals | | | | | |

**Course Code: Computer Networks**

**Course Description:**
This course provides students with an exploration of fundamental computer network concepts, including hardware, software, transmission media, addressing, and routing. It covers essential technologies and protocols necessary for effective comprehension and management of modern computer networks.

**Course Aims & Objectives:**

| S. No | COURSE OBJECTIVES |
|---|---|
| 1 | Equip students with a thorough understanding of computer network concepts apart from developing comprehensive understanding of network architecture and protocols by providing hands on experience on Cisco Packet tracer software. |
| 2 | Ensure that students possess the ability to analyse network protocols, topologies and characteristics of various categories of transmission media. |
| 3 | Provide students with a foundational proficiency in IP addressing and understand the role of switches in network management. |
| 4 | Develop in students a robust comprehension of spanning tree protocol and explore network routing techniques. |
| 5 | Enable students to define the need of network monitoring and implementing WLAN standards apart from handling IP ACLs. |

**Course Outcomes:**

At the end of the course, the student will / will be…

| NO | COURSE OUTCOME | BTL | PO | PSO |
|---|---|---|---|---|
| **CO1** | Understand the practical applications and differences of various networks along with protocol hierarchies apart from comparing OSI and TCP/IP reference models. | K2 | **1,2** | **1** |
| **CO2** | Comprehend network protocols and topologies apart from identifying and analysing transmission media | K2 | **1,2** | **1** |
| **CO3** | Utilize Cisco Packet Tracer to simulate and demonstrate routing algorithms and protocols effectively. | K3 | **1,2** | **1** |
| **CO4** | Evaluate and analyse advanced routing protocols. | K4 | **1,2** | **1** |
| **CO5** | Comprehend the purpose and management of IP ACLs apart from configuring and managing NAT. | K2 | **1,2** | **1** |

**For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create**

| CO-PO-PSO MATRIX | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **CO NO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PSO1** | **PSO2** |
| **CO1** | 2 | 3 | | | | | | 2 | |
| **CO2** | 3 | 3 | | | | | | 3 | |
| **CO3** | 3 | 3 | | | | | | 3 | |
| **CO4** | 3 | 3 | | | | | | 3 | |
| **CO5** | 3 | 3 | | | | | | 3 | |

**Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively**

**Course Structure:**

# Unit – I: Introduction to Computer Networks (15 Hrs.)

1.1 Introduction: **Network classifications:** LAN, MAN, WAN

1.2 **Data and signals:** analog and digital, periodic analog signals, digital signals, bit rate, baud rate, bandwidth

1.3 **Transmission impairments:** attenuation, distortion and noise

1.4 **Network models**: OSI model layers and their functions, TCP/IP protocol suite.

**Description:**
This course is tailored to provide a structured overview of the networking fundamentals, equipping students with the necessary knowledge to understand and work with various network types and models.

**Examples/Applications/Case Studies:**
1. Installation of Cisco Packet Tracer Software.
2. Study of basic network commands and network configurations.

**Exercises:**
1. Install Cisco packet tracer and perform networking operations.

**Learning Outcomes:**

By the end of the unit, students will have a comprehensive understanding of computer network fundamentals and hands-on experience with Cisco Packet Tracer for performing network operations.

**Web Resources:**

1. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai. "Download Cisco Packet Tracer – step – by – step instructions", 2022.
   https://www.youtube.com/watch?v=yjLTPBingE&list=PLnpr13oHoA7bF7yQTjMHB4mb8BtvGYyzf

2. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai. "Introduction to Cisco Packet Tracer", 2022.
   https://www.youtube.com/watch?v=oM8w0swQFaE&list=PLnpr13oHoA7bF7yQTjMHB4mb8BtvGYyzf&index=2

3. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai, "Create a simple LAN connection".
   https://www.youtube.com/watch?v=7WBO8aQiK9A&list=PLnpr13oHoA7bF7yQTjMHB4mb8BtvGYyzf&index=4

4. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai, "Create a simple LAN connection with ping command".
   https://www.youtube.com/watch?v=LNSu-Xqrjds&list=PLnpr13oHoA7bF7yQTjMHB4mb8BtvGYyzf&index=5

## Unit – II:  Transmission Media (15 Hrs.)

2.1 **Network Basics** - Protocols, Topology

2.2 **Multiplexing:** FDM, TDM- Spread spectrum - Frequency hopping spread spectrum, Direct sequence spread spectrum,

2.3 **Transmission media**: guided and unguided media

2.4 **Communication Satellites:** Geostationary, Medium-Earth Orbit, Low Earth-orbit Satellites.

**Description:**
This unit provides an in-depth understanding of the fundamental components and configurations of computer networks. Students will explore various network protocols, topologies, and the different types of transmission media used in networking. The course covers both guided transmission media, and unguided transmission methods. Additionally, the unit examines the role and types of communication satellites, including geostationary, medium-Earth orbit, and low Earth-orbit satellites.

**Examples:**

1. Creating simple network connection using different transmission media in Cisco Packet Tracer.
2. Demonstrate network topologies using Cisco Packet Tracer

**Exercises:**

1. Creating and connecting networks using Cisco Packet Tracer.
2. Demonstrate creating network topologies.

**Learning Outcomes:**
By the end of this unit, students will be able to gain knowledge in network topologies and types of transmission media apart from hand – on experience in creating LAN connections using Cisco packet tracer..

**Web Resources:**

1. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai, Creating simple network connection using different transmission media in Cisco Packet Tracer.
   https://www.youtube.com/watch?v=TB4kUZ9nrok&list=PLnpr13oHoA7bF7yQTjMHB4mb8BtvGYyzf&index=8
2. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai, "Types of Topologies – Demonstrating Bus Topology using Cisco Packet Tracer".
   https://www.youtube.com/watch?v=RmDxQqr2h1I&list=PLnpr13oHoA7bF7yQTjMHB4mb8BtvGYyzf&index=13

# Unit – III: IP Addressing and Switches (15 Hrs.)

3.1 **IP Addressing Version 4:** purpose, hierarchy, Private IP Address

3.2 **IP Addressing Version 6:** Benefits, Notation, configuration, migrating to IPV6

3.3 **Subnetting:** basics, IP address class and subnet mask, VLSMs

3.4 **Layer 2 Switches:** features, types

3.5 **Controlling network traffic with Cisco Switches:** deciding fate of frames, Switching between Half and full duplex

**Description:**

This unit delves into advanced concepts of IP addressing, focusing on both IPv4 and IPv6, and provides a comprehensive understanding of subnetting and network traffic control using Cisco switches. The unit also covers the basics of subnetting, including IP address classes, subnet masks, and Variable Length Subnet Masks (VLSMs). Additionally, students will explore the purpose and functions of Layer 2 switches and gain hands-on experience in managing and controlling network traffic with Cisco switches.

**Examples:**

1. Perform initial switch configuration.
2. Demonstrate switch basic commands.

**Exercises:**
1. Demonstrate connecting LAN using switches.
2. Perform operations on switches

**Learning Outcomes:**
By the end of this unit, students will be able to understand the role of switches in computer network and differentiate IPV4 and IPV6 addressing versions.

**Web Resources:**

1. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai, "Differentiate Hub and switch".
https://www.youtube.com/watch?v=zZS3tYGtx3o&list=PLnpr13oHoA7bF7yQTjM HB4mb8BtvGYyzf&index=9

## Unit – IV: Network Routing (15 Hrs.)

4.1 **Spanning tree protocol:** operation flow

4.2 **VLAN**: benefits, managing and identifying, VLAN trunking

4.3 **Network Routing protocols:**-introduction, Routing Information Protocol(RIP)-Enhanced interior gateway routing protocol(EIGRP)-Open shortest path first protocol expansion(OSPF)

**Description:**

This unit covers advanced networking protocols and routing techniques essential for managing complex networks. Students will learn about the Spanning Tree Protocol (STP) and its operation, the benefits and management of VLANs, and VLAN trunking. The unit also delves into network routing, exploring various routing protocols used in routing.

**Examples:**
1. Performing an Initial Router Configuration.
2. Demonstrate static and dynamic routing

**Exercises:**
Demonstrate Dynamic Routing protocols like
1. OSPF.
2. RIP
3. EIGRP.

**Learning Outcomes:**
By the end of this unit, students will be able to Apply Python function, classes and modules to solve engineering problems.

**Resources:**

1. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai, "Differentiate bridges and router".
https://www.youtube.com/watch?v=83_07EDibus&list=PLnpr13oHoA7bF7yQTjMHB4 mb8BtvGYyzf&index=10

2. Otom Gurutech Trainer, Kenya, 2023, "How to Configure RIP, EIGRP and OSPF using Cisco Packet Tracer".
https://www.youtube.com/watch?v=ggCmnt7cD_g

## Unit – V: Monitoring Networks (15 Hrs.)

5.1 **Monitoring Networks:** purpose, going over Air, locally and globally Devices-Sharing Airwaves, Modulating the Airwaves

5.2 WLAN Standards

5.3 **IP Access Lists (IP ACLs):** features, types, rules, advantages

5.4 **NAT:** purpose, Operational flow, Configuring and managing NAT

**Description:**
This unit focuses on the techniques and tools for monitoring networks, the standards and operation modes of Wireless Local Area Networks (WLANs), and the implementation of IP Access Lists (IP ACLs) and Network Address Translation (NAT)..

**Examples:**

1. Handling IP ACL.

2. Configuring and managing NAT.

**Exercises:**

1. Configure SNAT using Cisco Packet Tracer.
2. Router Access Control List using Cisco Packet Tracer.

**Learning Outcomes:**
By the end of this unit, students will be able to handle ACL, configure and manage SNAT.

**Resources:**

1. Ramalingam Murugan, Vellore Institute of Technology, " Cisco Packet Tracer – SNAT", https://www.youtube.com/watch?v=p-t2qUNwFec
2. Er Sital Mandal, "Router Access Control List using Cisco Packet Tracer", 2021. https://www.youtube.com/watch?v=zH8MxRCBRko
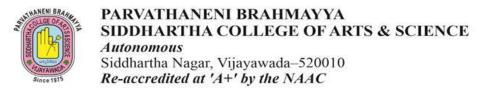
**Text Books**

1. David J.Wetherall, Andrew S.Tanenbaum, "Computer Networks", 5th Edition, Pearson Education, 2012.
2. Behrouz A. Forouzan, "Data Communication and Networking", 4th Edition, Tata McGraw Hill, 2007.

**References:**

1. Andrew S. Tanenbaum, Nick Feamster, David J. Wetherall, "Computer Networks", 6th Edition, Pearson Education, 2022.

**Web Resources:**

1. Dr. K. Sudha, Assistant Professor, SRM Institute of Science and Technology , Chennai. "Download Cisco Packet Tracer – step – by – step instructions", 2022. https://www.youtube.com/watch?v=yjLTPBingE&list=PLnpr13oHoA7bF7yQTjMHB4mb8BtvGYyzf
2. DigiDev, Cisco Packet Tracer for Beginers, https://www.youtube.com/watch?v=ty0HMs48U1k

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**COMPUTER NETWORK SEMESTER -END QUESTION PAPER STRUCTURE**

| Course Code & Title of the Course: | 23CGMAL234 : Computer Networks |
|---|---|

| Offered to: | B.Sc Hons. (CSCS) |
|---|---|
| Category: | SEMESTER: 3 |
| Max. Marks | 70 |
| Max.Time | 3 Hrs |

## Section A: Short Answer Questions (20 Marks)

### Answer All questions. Each question carries 4 Marks.

1. (a) Explain about LAN with an example. K2
   **OR**
   (b) Classify between analog and digital signals. K1

2. (a) Define Spread spectrum. K1
   **OR**
   (b) Explain types of Multiplexing. K2

3. (a) Explain about IP addressing. K2
   **OR**
   (b) Explain about Subnetting. K2

4. (a) Define routing. K1
   **OR**
   (b) Write a note on VLAN.K1

5. (a) Explain about ACL.K2
   **OR**
   (b) Describe WLANs.K2

## Section B: Long Answer Questions (50 Marks)

### Answer All questions. Each question carries 10 Marks.

6. (a) Classify types of Networks.K3
   **OR**
   (b) Classify various OSI Reference Model. K3

7. (a) Summarize guided Transmission media..K3
   **OR**
   (b) Explain about various Communication Satellites in detail. K2

8. (a) Explain about IPV4 and to use it. K2
   **OR**
   (b) Explain about IPV6 and compare it with IPV4. K2

9. (a) Configure the OSPF Protocol with an example.K4
   **OR**
   (b) Configure the Routing Information Protocol with an example.K4

10. (a) What is NAT and how does it works. K1
    **OR**
    (b) Explain how to Monitor Networks. K2