BCA (System Administration and Cyber Security)
Detailed Syllabus

Semester – I	**Course Category**			
3SCS1-DC-001-T	**L**	**T**	**P**	**C**
Network Essentials	4	0	0	4

Pre-requisites: Basics of Computer and Network

Course Objective:

- To understand basic networking concepts, hardware, and OSI/TCP-IP models.
- To build and configure networks using Packet Tracer and IP addressing.
- To explain how protocols and TCP/UDP handle data communication.
- To use Cisco IOS commands to identify and fix network issues.
- To ensure network security by checking threats and unauthorized access.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Understand basic networking concepts, hardware, and OSI/TCP-IP models.	L1 & L2
CO2: Apply knowledge to build and configure networks using Packet Tracer and IP addressing.	L3
CO3: Analyze the working of network protocols and TCP/UDP communication.	L4
CO4: Analyze and troubleshoot network issues using Cisco IOS commands.	L3 & L4
CO5: Evaluate network performance and security methods to protect systems.	L5

***Level of Learning: Level 1 (L1) - Remember ; Level 2 (L2) – Understand; Level 3 (L3) –Applye; Level 4 (L4) –Analyze; Level 5 (L5) -Evaluate;.Level 6 (L6) -Create. Mention the highest level that will be attained in the Course Outcome.*

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	3	2	1	1	-	-	2	1	-	2	2	1
CO2	3	2	2	2	1	2	2	1	1	2	3	2
CO3	3	2	2	1	1	-	2	-	-	2	3	2
CO4	3	2	3	3	2	2	2	1	1	2	2	3
CO5	3	2	3	2	2	2	3	2	2	3	2	3

High-3 Medium-2 Low-1

Course Contents:

Unit I: Network Concepts & Connectivity

Uses of computer networks and network software ,Network transmission speed and capacity ,Roles of clients and servers in a network ,Network infrastructure devices and documentation ,Host connectivity requirements for mobile and cell devices ,Packet Tracer installation and local device setup ,Packet Tracer user interface and basic configuration ,Simulated home network construction ,Ethernet twisted-pair cable signaling ,Coaxial and fiber-optic cabling characteristics ,Connectivity verification in routed networks ,Network standardization and reference models.

Unit II: Protocols, Standards, and Models

Network communication protocols and standards ,Comparison of OSI and TCP/IP models ,Ethernet Layer 1 and Layer 2 functions ,Encapsulation process and Ethernet framing ,Three-layer network design model functions ,Access layer communication and broadcast containment ,Routing needs and router table functionality ,Binary to decimal system calculations for networking ,IPv4 addressing, subnets, and address classes ,Public vs. private IPv4 address ranges ,Unicast, multicast, and broadcast address comparisons ,IPv6 features and transition from IPv4

Unit III: Client-Server & Transport Layer

Client and server interaction principles ,TCP and UDP transport layer functions ,Port number utilization for TCP/IP ,Common application layer services and network apps ,DNS and HTTP/HTML protocols ,FTP, Telnet, and SSH protocols ,Email protocol operations ,Home network components and wired/wireless technologies ,Wi-Fi standards and traffic control ,Secure integrated wireless router configuration ,ISP connectivity options and network virtualization ,Mobile device Wi-Fi settings for internet access

Unit IV: Threats, Mitigation, and Configuration

Social engineering and security threat types ,Malicious software types and mitigation ,Denial of Service (DoS) and brute force attacks ,Antimalware software and service disruption prevention ,Security tools and software update management ,Wireless security vulnerability addressing ,User authentication and firewall settings configuration ,In-band and out-of-band management access comparison ,Cisco LAN switch characteristics ,Cisco LAN switch boot process ,Cisco small business router features ,Cisco router boot process and sequences

Unit V: Troubleshooting with Cisco IOS

Network troubleshooting approaches and methodologies ,Physical layer problem detection ,Network utility troubleshooting techniques ,Wireless network problem

resolution ,Internet connectivity problem diagnosis ,Utilizing outside sources and internet resources for fixes ,Cisco IOS navigation and mode switching ,Cisco IOS configuration commands for network devices ,Device operation monitoring using show commands ,Status verification for router and switch interfaces ,Basic IOS security best practices for mitigation ,Comprehensive troubleshooting lab and final review

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	**External Assessment (EST #)**	**(A, Assignment I-V, Q, MST-I & II #)**
Weightage (%)	60	40

*A-Attendance; Assignment I-V (Class Assignment/Home Assignments/Case Discussions/Term Papers/Mini Project); Q-Quiz (5 Quizzes), MST-I, MST-II, EST. (# MST-I & IIconducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

List of Books:

Textbook:

1. CCENT/CCNA ICND1: Official Cert Guide, Wendell Odom, Pearson Education, 3rd Edition, 2013.

Reference Books:

1. Computer Networks, Andrew S. Tanenbaum and David J. Wetherall, Pearson Education, 5th Edition, 2013.
2. Data Communications and Networking, Behrouz A. Forouzan, McGraw Hill Education, 5th Edition, 2017.
3. Computer Networking: A Top-Down Approach, James Kurose and Keith Ross, Pearson Education, 8th Edition, 2020.
4. Networking Essentials Companion Guide, Cisco Networking Academy, Cisco Press, 1st Edition, 2022.
5. Network Security Essentials: Applications and Standards, William Stallings, Pearson Education, 6th Edition, 2017.

Important Websites:

1. **Cisco Networking Academy:** Networking Essentials Course
2. **Packet Tracer Official Site:** Cisco Packet Tracer Resource –
3. **Skills for All (by Cisco):** Free Networking Labs
4. **Cisco Networking Academy Playlist (YouTube):** Networking Essentials Full Lectures – (Video Lecture)
5. **NPTEL (IIT Kharagpur):** Computer Networks Lecture Series -(Video Lecture)

BCA (System Administration and Cyber Security)
Detailed Syllabus

	Course Category			
Semester – I				
3SCS1-SE-003-T	**L**	**T**	**P**	**C**
Computer Fundamentals	3	0	0	3

Pre-requisites: Basic knowledge of electronic devices

Course Objective:

- To identify basic computer parts (CPU, memory) and their evolution.
- To describe and explain types of software and functions of Operating Systems.
- To apply number conversion to binary and demonstrate logic gates.
- To classify internet connectivity and use basic cybersecurity tools.
- To construct algorithms and flowcharts to solve simple problems.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Identify basic components of a computer system (CPU, memory) and outline their evolution.	L1 & L2
CO2: Explain types of software and describe the functions of Operating Systems.	L3
CO3: Apply number system concepts to convert decimal numbers into binary and demonstrate logic gates.	L4
CO4: Analyze internet connectivity and examine basic cybersecurity measures to protect systems.	L3 & L4
CO5: Design algorithms and flowcharts to solve simple real-life problems.	L5

**Level of Learning: Level 1 (L1) - Remember ; Level 2 (L2) – Understand; Level 3 (L3) –Applye; Level 4 (L4) –Analyze; Level 5 (L5) -Evaluate;.Level 6 (L6) -Create. Mention the highest level that will be attained in the Course Outcome.*

Articulation Matrix

(Program Articulation Matrix is formed by the strength of the correlation of COs with POs and PSOs. The strength of correlation isindicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation)

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	3	-	-	-	1	-	-	-	-	1	3	-
CO2	3	2	-	-	1	-	-	-	-	2	3	1
CO3	2	3	2	-	-	-	-	-	-	1	2	3
CO4	2	2	2	3	2	1	2	2	1	2	3	2
CO5	1	3	3	1	1	-	-	-	2	3	2	3

High-3 Medium-2 Low-1

Course Contents:

Unit-I: Introduction & Computer Hardware

Definition, Characteristics, and Applications of Computers. Evolution and Generations of Computers (1st to 5th).Functional Block Diagram: ALU, CU, CPU, Input, and Output Units. Input Devices: Keyboard, Mouse, Scanner, OMR, Barcode Reader. Output Devices: Monitors (CRT, LCD, LED), Printers (Impact & Non-Impact). Primary Memory: RAM (SRAM, DRAM), ROM (PROM, EPROM, EEPROM), Cache Memory. Secondary Storage: HDD, SSD, Magnetic Tapes, Optical Disks (CD/DVD/Blue-ray). Concepts of Hardware, Software, and Firmware.

Unit-II: Data Representation & Digital Logic

Number Systems: Binary, Octal, Decimal, and Hexadecimal. Inter-conversion between Number Systems. Binary Arithmetic: Addition, Subtraction, Multiplication, Division. Complements: 1's and 2's Complement Subtraction. Computer Codes: BCD, EBCDIC, ASCII, and Unicode. Boolean Algebra: Fundamental Laws and De-Morgan's Theorem. Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR. Combinational Circuits: Design of Half-Adder and Full-Adder.

Unit-III: Software & Operating System Concepts

Software Types: System Software, Application Software, and Utility Programs. Introduction to Operating System: Functions, Roles, and Importance. Types of OS: Batch, Multiprogramming, Time-sharing, Real-time, and Distributed. User Interfaces: CLI (MS-DOS) vs. GUI (Windows). Process Management: Multitasking and Multiprocessing concepts. Storage Management: File Management, Folders, and Directory structure. Overview of Popular OS: Windows, Linux, and Unix.

Unit-IV: Problem Solving & Programming Logic

Problem-Solving Techniques and Program Development Life Cycle. Algorithms: Definition, Characteristics, and Examples. Flowcharts: Symbols, Rules, Advantages, and Limitations. Pseudo Codes: Basic structure and conversion from Algorithms. Programming Languages: Machine Level, Assembly Level, and High-Level Languages. Language Translators: Assembler, Compiler, and Interpreter.

Unit-V: Networking, Internet & Modern Trends

Computer Networks: Definition, Goals, and Types (LAN, MAN, WAN). Network Topologies: Bus, Star, Ring, Mesh, and Tree. The Internet: WWW, Web Browsers, Search Engines, URL, and Domain Names. Email & Collaboration: Creating accounts, Attachments, and Google Apps (Drive/Docs). Cyber Security: Computer Viruses, Malware, Antivirus, and Firewalls. Digital Payments: Electronic Payment Systems, UPI, E-wallets, and Digital Signatures. Modern Trends: Introduction to Cloud Computing, IoT (Internet of Things), and AI.

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	**External Assessment (EST #)**	**(A, Assignment I-V, Q, MST-I & II #)**
Weightage (%)	60	40

*A-Attendance; Assignment I-V (Class Assignment/Home Assignments/Case Discussions/Term Papers/Mini Project); Q-Quiz (5 Quizzes), MST-I, MST-II, EST. (# MST-I & IIconducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

List of Books:

Textbook:

1. Computer Fundamentals: Pradeep K. Sinha and Priti Sinha, BPB Publications, 6th Edition, 2017.

Reference Books:

1. Introduction to Computers: Peter Norton, Tata McGraw Hill Education, 7th Edition, 2017.
2. How to Solve it by Computer: R.G. Dromey, Pearson Education, 1st Edition, 2006.
3. Digital Logic and Computer Design: M. Morris Mano, Pearson Education, 1st Edition, 2016.
4. Fundamentals of Information Technology: Alexis Leon and Mathews Leon, Vikas Publishing House, 2nd Edition, 2009.

Important Websites:

1. **Swayam (NPTEL) - Computer Fundamentals:** https://onlinecourses.swayam2.ac.in/cec21_cs18/preview
2. **TutorialsPoint - Computer Fundamentals:** https://www.tutorialspoint.com/computer_fundamentals/index.htm
3. **GeeksforGeeks - Number System & Logic Gates:** https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
4. **GCFGlobal - Basic Computer Skills:** https://edu.gcfglobal.org/en/computerbasics/

5. **Javatpoint - Operating System Concepts:** https://www.javatpoint.com/os-tutorial

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Semester – I | **Course Category**
3SCS1-PW-004-P | **L T P C**
Project-work / Apprenticeship / Community Engagement | 0 0 4 2
Pre-requisites: Basic knowledge of electronic devices

Course Objectives:

- To provide practical exposure to industry practices, community work, or hands-on projects.
- To inculcate social responsibility and problem-solving skills through fieldwork or project execution.
- To enhance student skills through interaction with real-world problems and professional environments.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Identify and understand community/industry problems through direct engagement.	L1
CO2: Plan and execute a mini-project or participate in an apprenticeship/community activity.	L3
CO3: Apply theoretical knowledge to practical situations.	L4
CO4: Develop professional, social, and ethical values through collaborative activities.	L3 & L4
CO5: Present findings and experiences in a structured format.	L5

**Level of Learning: Level 1 (L1) - Remember ; Level 2 (L2) – Understand; Level 3 (L3) –Applye; Level 4 (L4) –Analyze; Level 5 (L5) -Evaluate;.Level 6 (L6) -Create. Mention the highest level that will be attained in the Course Outcome.*

Articulation Matrix

(Program Articulation Matrix is formed by the strength of the correlation of COs with POs and PSOs.

The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation,

and 1 for slight (low) correlation)

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	-	-	2	2	2	1	-
CO2	2	3	3	2	1	-	2	3	3	2	2
CO3	3	2	3	3	2	1	2	2	2	3	2
CO4	2	1	1	2	3	3	3	3	1	2	3
CO5	2	2	2	2	1	1	2	3	2	2	2

Content:

Unit 1: Orientation & Need Assessment

- Introduction to project/apprenticeship/community engagement.
- Group discussion on types of social/industry-based problems.
- Lab Exp 1: Identifying a real-world problem or organization need.

Unit 2: Planning and Proposal Development

- Framing project objectives and action plans.
- Mapping resources and stakeholders.
- Lab Exp 2: Prepare a project proposal or work plan.

Unit 3: Fieldwork / Engagement Execution

- Execution of the project/apprenticeship/community task.
- Continuous mentoring and self-monitoring.
- Lab Exp 3: Field visits, data collection, interviews, implementation steps.

Unit 4: Report Preparation and Reflection

- Analyzing the outcome of the project or engagement.
- Preparing project documentation.
- Lab Exp 4: Writing the final report and reflective journal.

Unit 5: Presentation & Evaluation

- Presentation of the project outcome.
- Feedback and assessment.
- Lab Exp 5: Oral presentation and submission of final report.

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	**External Assessment (EST #)**	**(A, Assignment I-V, Q, MST-I & II #)**
Weightage (%)	50	50

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List of Books:

Reference Books:

1. Sanjay Bhayani, Project Work and Report Writing, Shree Niwas Publications (2022).
2. Dr. Rajendra Kumar, Community Engagement and Social Responsibility, Neelkamal Publications.
3. Arvind Kumar, Apprenticeship and Skill Development, New Academic Publishers.

BCA (System Administration and Cyber Security)
Detailed Syllabus

Semester – I
3SCS1-DC-001-P
Network Essentials Lab
Pre-requisites: Basics of Computer and Network

Course Category			
L	**T**	**P**	**C**
0	0	4	2

Course Objective:

- To understand basic networking concepts, hardware, and OSI/TCP-IP models.
- To build and configure networks using Packet Tracer and IP addressing.
- To explain how protocols and TCP/UDP handle data communication.
- To use Cisco IOS commands to identify and fix network issues.
- To ensure network security by checking threats and unauthorized access.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Understand basic networking concepts, hardware, and OSI/TCP-IP models.	L1 & L2
CO2: Apply knowledge to build and configure networks using Packet Tracer and IP addressing.	L3
CO3: Analyze the working of network protocols and TCP/UDP communication.	L4
CO4: Analyze and troubleshoot network issues using Cisco IOS commands.	L3 & L4
CO5: Evaluate network performance and security methods to protect systems.	L5

**Level of Learning: Level 1 (L1) - Remember ; Level 2 (L2) – Understand; Level 3 (L3) –Applye; Level 4 (L4) –Analyze; Level 5 (L5) -Evaluate;.Level 6 (L6) -Create. Mention the highest level that will be attained in the Course Outcome.*

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CO3	3	2	2	1	1	-	2	-	-	2	3	2
CO4	3	2	3	3	2	2	2	1	1	2	2	3
CO5	3	2	3	2	2	2	3	2	2	3	2	3

High-3 Medium-2 Low-1

Course Experiments:

1. CLI Navigation: How do you access a Router or Switch and type commands to switch between different operation modes?
2. System Identity: How can you assign a unique name (Hostname) to your Router and set the system time correctly?
3. Cable Check: How do you connect Copper and Fiber cables and verify if the link lights are green?
4. MAC Address Table: How can you check which hardware addresses (MAC) the Switch has stored in its memory?
5. Port On/Off: What commands are used to manually disable (`shutdown`) or enable (`no shutdown`) a specific port?
6. Data Packet Inspection: How do you open a data packet in simulation mode to see where the hardware address is located?
7. Static IP Setting: How do you manually enter an IP address, Subnet Mask, and Default Gateway into a computer's settings?
8. IPv6 Setup: How do you enable IPv6 and observe how a computer automatically creates its own address?
9. Sub-netting: How can you break a large network into two smaller parts to improve security and speed?
10. Auto-IP (DHCP): How do you configure a Router to automatically give IP addresses to any computer that joins?
11. ARP Analysis: How can you observe a computer finding the hardware address (MAC) of another device using its IP?
12. The Exit Route: How do you configure a "Default Gateway" to tell the Router which path to use for internet traffic?
13. Custom Website Link: How do you edit a system file (`hosts`) to link an IP address to a name like "www.myname.com"?
14. Port Checking: How do you scan the system to see which digital "doors" (Ports) are open and vulnerable?
15. Secure Login (SSH): How do you create an encrypted path to control a Router remotely from another location?
16. File Transfer (FTP): How do you use the command line (CLI) to download a file from a remote server to your system?
17. TCP vs. UDP: How do you identify the difference between a TCP "handshake" and a UDP data stream?
18. Wi-Fi Security: How do you set up a password on a wireless router using the strongest WPA2 security setting?

19. Password Hashing: How can you lock Router passwords using encryption so they cannot be read in plain text?
20. Port Security: How do you program a Switch to block access if an unknown laptop is plugged into a specific port?
21. Block Specific User (ACL): How do you create an Access Control List to prevent a specific computer from reaching a server?
22. Disable Telnet: How do you shut down insecure login methods (Telnet) and force the use of secure paths?
23. Legal Warning Banner: How do you create a "Message of the Day" warning on the login screen for legal security?
24. Console Lock: How do you put a password on the physical cable slot of the Router to prevent local hacking?
25. Path Finder (Tracert): How do you identify which specific router in a network path is broken or failing?
26. Config Backup: How do you copy and save all Router settings to a safe remote server (TFTP)?
27. Stress Test (Ping): How do you send continuous signals to check if a network connection is stable or dropping?
28. Factory Reset: How do you completely erase all settings to return a Router to its original "out-of-the-box" state?

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	**External Assessment (EST #)**	**(A, LR, MST-I & II #)**
Weightage (%)	50	50

*A-Attendance; Lab Record Submission, MST-I, MST-II, EST. (# MST-I & IIconducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

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2. **Packet Tracer Official Site:** Cisco Packet Tracer Resource –
3. **Skills for All (by Cisco):** Free Networking Labs
4. **Cisco Networking Academy Playlist (YouTube):** Networking Essentials Full Lectures – (Video Lecture)
5. **NPTEL (IIT Kharagpur):** Computer Networks Lecture Series -(Video Lecture)