

# System Administration & IT Infrastructure – Week 1

## System Administration & IT Infrastructure

This manual provides extended theoretical explanations for **Week 1**. It is designed as institute-level lecture notes with definitions, examples, and real-world context. It can be used as a student textbook or instructor reference.

### Understanding System Administration

**System administration** is the discipline of managing and maintaining computer systems, servers, and infrastructure so they operate reliably, securely, and efficiently. A system administrator ensures uptime, protects data, manages users, and supports organizational operations. In real companies, servers run email systems, databases, websites, and authentication systems. If these systems fail, business stops.

**Example:** A hospital server stores patient records. A system administrator ensures the system is always available and protected from cyber threats.

### Core Responsibilities of a System Administrator

A system administrator performs installation, configuration, monitoring, troubleshooting, security enforcement, and backup management. They apply updates, monitor logs, prevent intrusions, and optimize performance. Admins must also document their work and follow change management policies.

**Example:** When a company adds 50 new employees, the admin creates accounts, sets permissions, and configures access policies.

### Why Server Administration is Critical

Modern organizations are fully dependent on IT infrastructure. Banks process financial transactions, schools manage academic records, and businesses handle customer databases through servers. Downtime can cause revenue loss, legal problems, and reputational damage. Professional administration reduces risk and ensures continuity.

**Example:** An e-commerce server outage during a sale can cost thousands of dollars in minutes.

### Career Value and Motivation

Server administration is a high-demand global skill. Organizations require trained professionals to manage on-premises servers and cloud platforms. Career paths include system engineer, infrastructure specialist, DevOps technician, and cloud administrator. With experience, professionals move into architecture and consulting roles. This skill provides stable income and long-term career growth.

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## **Course Goals and Learning Outcomes**

This course aims to build foundational and professional server management skills. Students will understand server architecture, installation methods, automation tools, and administrative best practices. Graduates should be able to deploy and manage a production-ready Windows server environment.

## **Professional Work Ethics in IT**

IT professionals handle sensitive organizational data. Ethics require confidentiality, integrity, and accountability. Unauthorized access, data misuse, or negligence can cause serious legal consequences. Professional administrators respect privacy, follow policies, and maintain transparency.

**Example:** Accessing employee salary records without authorization is unethical and illegal.

## **Introduction to Windows Server 2019**

**Windows Server 2019** is an enterprise-grade server operating system designed to manage networks, users, applications, and security infrastructure. It supports virtualization, hybrid cloud integration, identity management, and centralized administration. It is widely used in corporate IT environments due to reliability and security features.

## **Windows Server Editions Explained**

Windows Server is released in multiple editions tailored to different business sizes. The Standard edition supports general workloads. The Datacentre edition supports unlimited virtualization and large-scale environments. The Essentials edition targets small businesses with basic needs.

Choosing the right edition depends on infrastructure size, virtualization requirements, and budget.

## **Deployment Strategies**

Deployment refers to how a server is installed and introduced into an environment. Options include clean installation, upgrade installation, automated network deployment, and image-based deployment. Organizations often use scripted deployments to ensure consistency.

**Example:** Large companies deploy hundreds of servers using automated templates.

## **Servicing and Maintenance**

Servers require continuous updates and monitoring. Servicing includes patch management, security updates, hardware checks, and performance optimization. Preventive maintenance reduces failures and increases lifespan.

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## Activation and Licensing

Proper licensing ensures legal operation and access to vendor support. Enterprise environments use volume licensing and centralized activation services. Licensing also impacts virtualization rights and scalability.

## Windows Server Core Architecture

Server Core is a minimal installation option that removes the graphical interface. It reduces system overhead, increases performance, and minimizes attack surface. Administrators manage it using command-line tools and remote management utilities.

## Server Core vs Desktop Experience

The Desktop Experience provides a graphical interface suitable for beginners and training environments. Server Core focuses on performance, security, and reduced maintenance. Enterprises prefer Server Core for production systems.

## Administrative Tools Overview

Modern server management uses centralized tools. Web-based dashboards allow administrators to manage multiple machines remotely. Automation tools reduce repetitive tasks and human error.

## PowerShell and Automation

**PowerShell** enables scripting and automation of administrative tasks. Administrators can manage users, services, and policies at scale. **Automation** improves efficiency and consistency.

## Delegation and Role-Based Access

Delegation allows assigning limited responsibilities to staff. This follows the principle of least privilege, improving security and accountability.

**Example:** Helpdesk employees reset passwords but cannot change system settings.

## Administration Best Practices

Best practices include documentation, backup strategies, monitoring systems, disaster recovery planning, and strict security controls. Professional administrators think proactively rather than reactively.

## Conclusion

**System administration** is a professional discipline requiring technical knowledge, discipline, and ethics. Continuous learning and hands-on practice are essential for mastery.