**Software Development Life Cycle (SDLC)**

**Software Development Life Cycle (SDLC)** is a structured process used by software developers to design, develop, test, and deploy high-quality software. It provides a systematic approach to software development, ensuring that projects are completed efficiently, within budget, and according to user requirements.

1. Stages of SDLC

The SDLC consists of the following key phases:

**1. Planning Phase**

* **Objective**: Define project goals, feasibility, and scope.
* **Key Activities**:
  + Identifying the purpose of the software.
  + Conducting feasibility studies (technical, operational, financial).
  + Estimating costs, timelines, and resources.
  + Defining project risks and mitigation strategies.
* **Output**: Project Plan, Feasibility Study Report.

**2. Requirement Analysis Phase**

* **Objective**: Gather and document user and system requirements.
* **Key Activities**:
  + Interacting with stakeholders (clients, users, business analysts).
  + Understanding functional and non-functional requirements.
  + Creating Software Requirement Specification (SRS) document.
* **Output**: SRS Document.

**3. Design Phase**

* **Objective**: Convert requirements into a structured system design.
* **Key Activities**:
  + Architectural Design (high-level structure of software).
  + Database Design (defining data models and schemas).
  + UI/UX Design (creating wireframes and user interface blueprints).
  + Defining modules and interactions between them.
* **Output**: System Design Document (SDD), UI/UX Mockups.

**4. Development (Coding) Phase**

* **Objective**: Implement the software based on the design specifications.
* **Key Activities**:
  + Writing code using programming languages (Java, Python, JavaScript, etc.).
  + Version control using GitHub, GitLab, Bitbucket.
  + Unit testing during development.
  + Code review and debugging.
* **Output**: Source Code, Executable Software.

**5. Testing Phase**

* **Objective**: Ensure software quality, functionality, and security.
* **Key Activities**:
  + Unit Testing (individual module testing).
  + Integration Testing (testing interactions between modules).
  + System Testing (verifying complete software functionality).
  + Performance Testing (checking speed and scalability).
  + Security Testing (ensuring data protection and access control).
* **Output**: Test Cases, Test Reports, Bug Reports.

**6. Deployment Phase**

* **Objective**: Release the software to the production environment.
* **Key Activities**:
  + Deploying on on-premise servers or cloud platforms (AWS, Azure, GCP).
  + Running final tests in the production environment.
  + Performing user acceptance testing (UAT).
  + Configuring CI/CD pipelines for automated deployment.
* **Output**: Deployed Software, Deployment Guide.

**7. Maintenance & Support Phase**

* **Objective**: Monitor and enhance software after deployment.
* **Key Activities**:
  + Fixing bugs reported by users.
  + Updating software based on new requirements.
  + Ensuring security patches and performance improvements.
  + Providing customer support.
* **Output**: Patches, Updates, Maintenance Reports.

**2. SDLC Models**

Different models define how SDLC phases are executed. Some popular models include:

1. **Waterfall Model** – Sequential execution of SDLC phases (best for simple projects).
2. **Agile Model** – Iterative development with continuous feedback (best for evolving requirements).
3. **Spiral Model** – Risk-driven development combining iterative and waterfall methods.
4. **V-Model (Validation & Verification Model)** – Testing is performed in parallel with development.
5. **DevOps Model** – Continuous integration, delivery, and deployment with automation.

**3. Best Practices in SDLC**

* Use **Agile** for flexible and fast-paced development.
* Automate **CI/CD** pipelines for seamless deployment.
* Implement **code reviews** and **testing automation** for quality assurance.
* Monitor applications using tools like **Sentry, DataDog, and New Relic**.
* Use version control systems like **GitHub, GitLab**.
* Follow security best practices to prevent **cyber threats**.