**Day 1: CPU, ALU, CU, Registers, and Cache Memory**

* Define CPU and its role as the computer's brain.
* Explain key CPU features (clock speed, cores, threads, etc.).
* Describe the function of the ALU in arithmetic and logic operations.
* Explain the role of the Control Unit (CU) in managing CPU operations.
* List and define types of CPU registers (e.g., ACC, PC, MAR, MDR).
* Understand cache memory levels (L1, L2, L3) and their roles.
* Differentiate between desktop, mobile, and server CPUs.
* Discuss high-performance CPUs and their applications.
* Explain the concept of CPU bottleneck and how to address it.
* Explore CPU failure symptoms and troubleshooting steps.
* Analyze CPU overheating causes and prevention methods.
* Define CPU hyper-threading and multithreading.
* Explain CPU-related metrics like TDP.
* Identify common CPU manufacturers and product lines.
* Discuss CPU’s relationship with other components (e.g., RAM).

**Day 2: GPU and Pipelining vs. Multithreading vs. Multitasking**

* Define GPU and its role in image and video processing.
* Differentiate between integrated and dedicated GPUs.
* List use cases for GPUs (gaming, video editing, etc.).
* Explain pipelining stages (fetch, decode, execute, etc.).
* Compare multithreading and multitasking.
* Explore GPU types for mobile and server use.
* Discuss GPU’s relevance in scientific computing.
* Understand machine learning and GPU acceleration.
* Explain GPU overheating issues and solutions.
* Discuss the concept of CUDA cores in GPUs.
* Explore real-time applications of multithreading.
* Compare cooperative and preemptive multitasking.
* Discuss GPU memory (VRAM) and its impact on performance.
* Identify examples of popular GPU models and brands.
* Explain multitasking's role in operating systems.

**Day 3: RAM and RAM-Related Issues**

* Define RAM and its purpose in data storage.
* Differentiate types of RAM (DRAM, SRAM, SDRAM, DDR versions).
* Explain virtual RAM and its use in systems.
* Explore symptoms of insufficient RAM.
* Identify solutions for faulty or incompatible RAM.
* Understand memory leaks and how to address them.
* Discuss RAM latency and speed.
* Compare DDR4 and DDR5 in modern systems.
* Explain the role of pagefile/swap space in virtual memory.
* Analyze RAM upgrade benefits for performance.
* Define asynchronous RAM and its characteristics.
* Explore typical RAM capacities for devices.
* Discuss RAM configuration in dual or quad-channel setups.
* Identify tools for monitoring RAM usage.
* Explain RAM’s relationship with CPU and motherboard.

**Day 4: ROM and Motherboard Components**

* Define ROM and its role in non-volatile memory.
* Differentiate types of ROM (EPROM, EEPROM, etc.).
* List use cases for Flash Memory.
* Discuss the motherboard as the computer's central hub.
* Identify key motherboard components (CPU socket, RAM slots, etc.).
* Explain the Northbridge and Southbridge functions.
* Describe motherboard form factors (ATX, mATX, Mini-ITX).
* Discuss BIOS/UEFI firmware functions.
* Explain fan headers and cooling integration.
* Identify typical rear I/O ports on motherboards.
* Discuss power supply connections (ATX, EPS connectors).
* Explore motherboard chipsets and compatibility.
* Explain the CMOS battery and its role.
* Discuss upgrading or replacing motherboards.
* Compare motherboard prices and features for different uses.

**Day 5: HDD, SSD, and NAS Storage**

* Define HDD and its components (platters, read/write head).
* Explain SSD technology and its advantages over HDDs.
* Compare HDD and SSD performance, durability, and cost.
* Define NAS and its role in centralized storage.
* List advantages and disadvantages of NAS.
* Discuss the use of RAID in storage solutions.
* Differentiate between RAID 0, 1, 5, 6, and 10.
* Explain cloud storage and its use in modern computing.
* Compare hybrid drives (SSHD) with traditional HDDs and SSDs.
* Explore external hard drives for portability and backup.
* Discuss tape storage for archival purposes.
* Understand Storage Area Networks (SAN) and their applications.
* Define paging in virtual memory.
* Explain disk fragmentation and its impact on performance.
* Identify common storage interfaces (SATA, NVMe, M.2).

**Day 6: IaaS, PaaS, SaaS, and DaaS**

* Define IaaS and list popular examples (AWS, Azure).
* Explain PaaS and its benefits for developers.
* Define SaaS and its advantages for end users.
* Compare IaaS, PaaS, SaaS, and DaaS.
* Define DaaS and its use cases in virtual desktops.
* Explore security considerations for cloud models.
* Discuss cost management in cloud services.
* Explain resource pooling in cloud computing.
* Define rapid elasticity in cloud services.
* Compare public, private, hybrid, and community cloud models.
* Discuss the scalability of cloud-based applications.
* Explain the role of APIs in cloud service integration.
* Identify common industries adopting cloud technologies.
* Discuss the importance of compliance in cloud services.
* Explore emerging trends in cloud computing.

**Day 7: Tech Stacks and Programming Languages**

* Define the LAMP stack and its components.
* Compare WAMP with LAMP for development.
* Explore MEAN, MERN, and MEVN stacks.
* List advantages and disadvantages of MongoDB vs. MySQL.
* Discuss the use of TypeScript in modern development.
* Differentiate frontend and backend programming languages.
* Explain the role of Python in full-stack development.
* Define common IDEs (e.g., Visual Studio, IntelliJ IDEA).
* Explore trends in web development frameworks.
* Discuss serverless computing and its impact.
* Compare compiled and interpreted programming languages.
* Define version control and tools like Git.
* Explain API development and REST principles.
* Discuss microservices architecture and its benefits.
* Explore the future of NoSQL and relational databases.

**Day 8: Network Topologies**

* Define and explain ring topology.
* Describe star topology and its advantages.
* Explain mesh topology (full vs. partial).
* Discuss bus topology and its limitations.
* Define tree topology and its hierarchical structure.
* Compare topologies based on fault tolerance.
* Explain scalability in different network topologies.
* Explore cost considerations for each topology.
* Discuss real-world applications of topologies.
* Define hybrid topologies and their use cases.
* Compare wireless vs. wired topologies.
* Discuss topology challenges in IoT networks.
* Define redundancy in network design.
* Explain network topology in data centers.
* Discuss software-defined networking (SDN).

**Day 9: Patch Panels, Switches, Routers, and Access Points**

* Define patch panels and their role in structured cabling.
* Explain hubs and their basic functionality.
* Compare switches and routers in a network.
* Define access points and their use in wireless networks.
* Discuss the role of repeaters in extending signal range.
* Identify key differences between Layer 2 and Layer 3 switches.
* Explain firewalls and their integration with routers.
* Discuss VLANs and their role in segmenting networks.
* Explore PoE (Power over Ethernet) capabilities in switches.
* Explain network address translation (NAT).
* Define load balancing in routers.
* Discuss the role of SD-WAN in modern networks.
* Explain QoS (Quality of Service) in switches.
* Compare consumer vs. enterprise-grade network equipment.
* Define the importance of firmware updates for network devices.

**Day 10: OSI Model and Common Network Ports**

* List the seven layers of the OSI model.
* Explain the role of the physical layer (Layer 1).
* Describe the function of the data link layer (Layer 2).
* Explore the network layer (Layer 3) and IP addressing.
* Define the transport layer (Layer 4) and TCP/UDP.
* Explain the application layer (Layer 7) protocols (HTTP, FTP).
* Identify commonly used network ports and their applications.
* Discuss the importance of the DNS protocol (port 53).
* Define HTTPS and its role in secure communication (port 443).
* Explain SNMP and its use in network management (ports 161/162).
* Discuss the relevance of Telnet and SSH for remote access (ports 23/22).
* Compare IMAP and POP3 for email access.
* Define FTP and its use cases (ports 20/21).
* Explain the role of firewalls in securing network traffic.
* Discuss how port forwarding works.

**Day 11: Network Device Hardening**

* Define network hardening and its purpose.
* Explain changing default credentials on devices.
* Discuss the importance of firmware updates.
* Define access control and its implementation in devices.
* Explain disabling unused services and ports.
* Discuss enabling logging and monitoring for devices.
* Define ACLs and their role in network security.
* Explain encryption protocols (e.g., HTTPS, SSH).
* Discuss network segmentation and its benefits.
* Explain backup and recovery planning for devices.
* Discuss intrusion detection and prevention systems (IDS/IPS).
* Explore the role of VPNs in secure remote access.
* Define physical security for network equipment.
* Discuss device authentication mechanisms.
* Explain patch management for network hardware

**Day 12: Cloud Computing Concepts**

* Define rapid elasticity and its significance in cloud computing.
* Explain resource sharing and resource pooling in cloud systems.
* Discuss load balancing and its importance in cloud environments.
* Define fault tolerance and its role in ensuring availability.
* Explain distributed file systems and their applications in cloud storage.
* Discuss the benefits of scalability in cloud services.
* Define virtualization and its importance in cloud infrastructure.
* Compare public, private, hybrid, and community cloud models.
* Explain the role of containerization in cloud computing.
* Discuss edge computing and its relationship with cloud services.
* Explore common challenges in cloud adoption.
* Define serverless computing and its advantages.
* Discuss compliance and regulatory requirements in cloud systems.
* Explain disaster recovery planning in cloud environments.
* Discuss the role of APIs in cloud service integration.

**Day 13: Runtime Environment and System Call Groups**

* Define runtime environment and its role in application execution.
* Discuss examples of runtime environments (e.g., JRE, Node.js).
* Explain system calls and their role in OS communication.
* Define process control system calls (e.g., fork(), exec()).
* Explore file management system calls (e.g., open(), read(), write()).
* Discuss device management system calls (e.g., ioctl()).
* Explain inter-process communication (IPC) system calls.
* Define memory management system calls (e.g., mmap()).
* Discuss information maintenance system calls (e.g., getpid()).
* Explain socket programming and related system calls.
* Explore process synchronization in runtime environments.
* Define shared memory and its use in IPC.
* Discuss error handling in system calls.
* Explore the role of runtime environments in debugging.
* Compare runtime environments for different programming languages.

**Day 14: TCP/IP, UDP, and Network Protocols**

* Define TCP/IP and its role in internet communication.
* Explain the key features of TCP (e.g., reliability, error checking).
* Compare TCP and UDP in terms of functionality.
* Define IP addressing and its importance in networking.
* Discuss DNS and its role in resolving domain names.
* Explain DHCP and how it assigns IP addresses dynamically.
* Define ARP and its function in mapping IP to MAC addresses.
* Discuss the difference between IPv4 and IPv6.
* Explain packet switching and its significance in networking.
* Explore common application layer protocols (HTTP, FTP, SMTP).
* Define the transport layer and its key responsibilities.
* Discuss network routing and its role in data delivery.
* Explain NAT and its use in private networks.
* Define ICMP and its role in error reporting.
* Explore the role of network monitoring tools like Wireshark.

**Day 15: Authorization, Authentication, and Accounting (AAA)**

* Define authentication and common methods (e.g., passwords, biometrics).
* Explain two-factor authentication (2FA) and its benefits.
* Discuss authorization and its role in access control.
* Define accounting and its importance in resource tracking.
* Explore the differences between authentication and authorization.
* Explain single sign-on (SSO) and its advantages.
* Discuss the role of tokens in authentication.
* Define encryption and its use in secure communication.
* Explain the principle of least privilege in authorization.
* Discuss the role of audit logs in accounting.
* Define federated identity and its use in authentication systems.
* Explore the role of multi-factor authentication in modern systems.
* Explain the importance of session management in AAA.
* Define public key infrastructure (PKI) and its role in security.
* Discuss best practices for implementing AAA systems.

**Day 16: Network Topologies and Peer-to-Peer vs. Client-Server Models**

* Define peer-to-peer (P2P) networking and its applications.
* Discuss client-server architecture and its advantages.
* Compare P2P and client-server in terms of scalability.
* Explain the role of centralization in client-server networks.
* Define hybrid topologies and their use cases.
* Discuss the fault tolerance of mesh topologies.
* Explain the hierarchical structure of tree topologies.
* Define ring topology and its historical significance.
* Explore bus topology and its limitations in modern networks.
* Discuss the role of middleware in client-server communication.
* Explain resource sharing in P2P networks.
* Define redundancy in network topologies.
* Compare latency in P2P vs. client-server models.
* Discuss the evolution of hybrid networks in IoT systems.
* Explain the role of load balancers in client-server models.

**Day 17: Non-Functional Requirements (NFRs)**

* Define performance as an NFR and its metrics.
* Explain reliability and its role in system stability.
* Discuss usability and its impact on user experience.
* Define scalability and its importance in system growth.
* Explore maintainability and its role in long-term support.
* Explain security as an NFR and common practices.
* Define interoperability and its importance in system integration.
* Discuss portability and its role in cross-platform compatibility.
* Explain efficiency in resource utilization as an NFR.
* Define compliance and its significance in regulated industries.
* Discuss fault tolerance and its role in system design.
* Explain availability and its impact on uptime.
* Define modularity and its importance in software design.
* Discuss accessibility as part of usability.
* Explore testability and its role in system development.

**Day 18: Common Network Ports and Device Hardening**

* Define the purpose of port numbers in networking.
* List common port numbers (e.g., 80 for HTTP, 443 for HTTPS).
* Explain the role of SSH (port 22) in secure remote access.
* Define FTP (port 21) and its use cases.
* Discuss IMAP and POP3 for email retrieval.
* Explain the importance of DNS (port 53) in name resolution.
* Discuss SNMP (ports 161/162) for network management.
* Define device hardening and its importance.
* Explain disabling unused services to reduce attack surfaces.
* Discuss role-based access control (RBAC) in device security.
* Define encryption for securing communication channels.
* Explain firmware updates in maintaining device security.
* Discuss monitoring and logging for intrusion detection.
* Define patch management in network devices.
* Explain backup and recovery practices for hardware.

**Day 19: Virtualization and Cloud Models**

* Define virtualization and its types (Type 1 and Type 2 hypervisors).
* Explain containers and their role in lightweight virtualization.
* Discuss the advantages of Type 1 hypervisors in enterprise settings.
* Compare Type 1 and Type 2 hypervisors.
* Define IaaS and its role in cloud infrastructure.
* Explore PaaS for application development.
* Discuss SaaS and its benefits for businesses.
* Define DaaS and its use cases in virtual desktops.
* Explain the concept of hybrid clouds.
* Discuss the role of edge computing in modern networks.
* Define multi-cloud strategies and their advantages.
* Discuss challenges in cloud security.
* Explain the role of DevOps in cloud environments.
* Define serverless computing and its applications.
* Explore the importance of compliance in cloud computing.

**Day 20: Operating Systems and Services**

* Define the role of an operating system (OS) in hardware management.
* List core OS services (e.g., process management, memory management).
* Explain file system management in OS.
* Discuss the importance of user authentication in OS security.
* Define the kernel and its role in system operations.
* Explore the differences between CLI and GUI.
* Discuss virtual memory and paging in OS.
* Explain OS support for networking protocols.
* Define multi-tasking and scheduling in OS.
* Explore inter-process communication (IPC) mechanisms.
* Discuss error handling and fault tolerance in OS.
* Define OS boot process and its components.
* Explain device driver management in OS.
* Discuss energy management features in modern OS.