

Backend & Distributed Systems with Security – Winter Arc Roadmap

This roadmap is designed for mastering Backend Engineering, Distributed Systems, and Security with Python as the primary language. It includes DBMS concepts and is split into sequential weekly learning modules.

Session 1 – Programming & Problem-Solving Core

Week 1-2 – Python Mastery

- Python syntax, data types, functions, OOP, decorators, error handling
- Modules, packages, iterators, generators, asyncio, threading, multiprocessing

Week 3-4 – Data Structures in Python

- Arrays, strings, linked lists, stacks, queues, hash maps, sets
- Trees (BST, AVL, Trie), graphs (BFS, DFS, shortest path), heaps, tries

Week 5 – Algorithms

- Searching & sorting algorithms
- Recursion, backtracking, greedy, dynamic programming basics, sliding window, two pointers

Week 6+ – Problem-Solving Drills

- Daily DSA practice (LeetCode, Codeforces)
- Focus on patterns: sliding window, two pointers, backtracking, binary search on answers

Session 2 – Backend, Distributed Systems & Security

Week 1 – Backend Fundamentals

- HTTP, REST API Design, FastAPI basics, CRUD operations
- Database integration with PostgreSQL (SQLAlchemy), Authentication (JWT, OAuth2)
- Caching with Redis, file uploads/downloads

Week 2 – Scaling to Real Systems

- WebSockets, message brokers (RabbitMQ/Kafka), background tasks
- API rate limiting, pagination & filtering

Week 3 – Distributed Systems Concepts

- Monolith vs Microservices, CAP theorem, Event-driven architecture
- Scaling, load balancing, fault tolerance, data consistency models

Week 4 – Security Layer

- OWASP Top 10, secure API design, input validation
- Secrets management, HTTPS/TLS setup, penetration testing basics

Week 5 – DevOps & Cloud Deployment

- Docker, Docker Compose, Kubernetes basics
- CI/CD pipelines, AWS basics (EC2, S3, RDS), monitoring with Prometheus & Grafana

Week 6 – DBMS Concepts

- Relational DB concepts: tables, keys, normalization, ACID properties

- Transactions, indexing, query optimization
- NoSQL concepts: document, key-value, columnar, graph databases
- Database security and backup strategies