# Software Engineering Theory Cheat Sheet (2025 Edition)

## 1. Software Development Lifecycle (SDLC)

- Phases: Requirements -> Design -> Implementation -> Testing -> Deployment -> Maintenance
- Agile (Scrum/Kanban): Iterative, sprint-based, fast delivery
- Waterfall: Sequential, fixed requirements
- DevOps: Combines Dev and Ops for CI/CD, monitoring, and automation

## 2. System Design Basics

- Monolith vs Microservices
- API Gateway, Load Balancer, CDN
- Scalability: Vertical vs Horizontal
- Availability: Redundancy, failover, self-healing
- Caching (Redis, CDN, Local)
- DB Sharding, Replication, Indexing

## 3. Networking Fundamentals

- HTTP vs HTTPS
- REST vs GraphQL
- DNS, TCP/IP, TLS, Proxy, Reverse Proxy
- WebSockets vs Polling vs SSE
- Load Balancers (L4 vs L7)
- VPNs, NAT, IP addressing

## 4. Security Fundamentals

- OWASP Top 10 (XSS, CSRF, SQLi, IDOR, RCE)
- JWT vs OAuth2 vs Sessions
- HTTPS, TLS, SSL Certificates
- Rate limiting, CORS, Firewall policies
- Zero Trust Architecture

## 5. Databases & Storage

- SQL: Relational (MySQL, PostgreSQL)
- NoSQL: Key-Value (Redis), Doc (MongoDB), Column (Cassandra)
- ACID vs BASE
- Indexes, Joins, Transactions
- CAP Theorem: Consistency, Availability, Partition Tolerance

## 6. Cloud Computing (2025 Trends)

```
- AWS, Azure, GCP
- SaaS vs PaaS vs IaaS
- Serverless: AWS Lambda, Cloud Functions
- Containers: Docker, Kubernetes
- Multi-cloud, hybrid cloud strategies
```

## 7. CI/CD & DevOps

```
- Tools: GitHub Actions, Jenkins, GitLab CI, ArgoCD
- Pipelines: Build -> Test -> Deploy
- IaC: Terraform, Pulumi
- Monitoring: Prometheus, Grafana, ELK Stack
- Observability: Logs, Metrics, Tracing
```

## 8. Testing & QA

```
- Unit, Integration, System, E2E
- TDD, BDD (e.g., pytest, JUnit, Selenium)
- Mocks, Stubs, Test Coverage
- Shift-left testing
```

## 9. Software Architecture Patterns

```
- MVC, MVVM
- Event-Driven Architecture
- Domain-Driven Design (DDD)
- Hexagonal (Ports and Adapters)
- CQRS & Event Sourcing
```

## 10. 2025 Hot Topics & Trends

```
- AI Coding Assistants (GitHub Copilot, Cody, GPT-4o)
- Edge Computing, WebAssembly
- Platform Engineering
- eBPF for observability/security
- Green/energy-aware software
- Secure by Design coding
- API-first development
- LLMOps (ML + DevOps)
```

## 11. Soft Skills & Career

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- System Design Interviews
- Behavioral Questions (STAR method)
- Communication & Collaboration
- Ownership & Problem Solving
- Writing design docs, RFCs, tech specs

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