



# TRAINING TRAINS

IT Services and IT Consultancy \ Internship-Inplant Training \ Software Training Institute

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உங்கள் கடை மற்றும் வியாபாரத்திற்கு ஏற்ற **Website & Android App** மற்றும் **Software** மிகச்சிறந்த முறையில் செய்து கொடுக்கப்படும்.

Expertise : **AI, Machine Learning & Data Science \ Cybersecurity & Ethical Hacking**  
**IoT, Blockchain & Cloud Computing \ Full Stack Web & Mobile Development**  
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**W3 App Developers**

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## API Design – 100+ Lab Exercises (Basic, Intermediate, Advanced)

### □ Basic Level (30+ Exercises)

**Goal:** Understand REST principles, build foundational APIs, and apply CRUD operations.

#### □ REST Fundamentals

- Design a RESTful API for a **Todo App** (CRUD operations).
- Define **HTTP verbs** (GET, POST, PUT, DELETE) with use-case examples.
- Build a **User Registration and Login API**.
- Create a **blog API** with pagination and search.
- Implement **status codes**: 200, 201, 204, 400, 401, 403, 404, 500.
- Handle **query parameters, path parameters, headers, and request bodies**.

#### □ API Resources & Models

- Design **resource naming conventions**.
- Create **JSON response structure** with success and error metadata.
- Model **nested resources** (e.g., /users/{userId}/posts).
- Implement **validation** for input data.

#### □ Basic Authentication & Rate Limiting

- Build **basic authentication** using API keys.
- Implement **rate limiting (fixed window)**.
- Setup **CORS policy** and explain preflight requests.

### □ Intermediate Level (40+ Exercises)

**Goal:** Build scalable, modular, and secure APIs with documentation and error handling.

#### □ API Versioning & Standards



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- Implement **URI-based versioning** (/api/v1/...).
- Compare **Header vs Query Parameter-based versioning**.
- Standardize **API response format** using JSend or JSON:API.

## ☐ API Documentation

- Use **Swagger/OpenAPI** to document endpoints.
- Generate API docs with **Postman** or **Redoc**.
- Create **sample request-response mockups**.

## ☐ Middleware & Modular Design

- Build middleware for:
  - Logging
  - Authentication
  - Response compression
- Structure **modular route controllers** and **service layers**.

## ☐ Error Handling

- Design a **custom error object** with error codes.
- Handle **global exception handling**.
- Implement **fallback responses** for service unavailability.

## ☐ Advanced Security

- Implement **OAuth2 login** via Google/Facebook.
- Use **JWT (JSON Web Tokens)** for session management.
- Add **role-based access control (RBAC)**.

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## ☐ Advanced Level (40+ Exercises)

**Goal:** Create robust, fault-tolerant APIs supporting microservices, GraphQL, async events, and real-world scalability.

## ☐ Asynchronous APIs & Event-Driven Design

- Build an **event-driven API** with Kafka or RabbitMQ.
- Create **webhooks** for event notifications (e.g., Stripe-style).



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- Implement **async email/SMS job queue** after signup.

## □ GraphQL & gRPC

- Build a **GraphQL server** with queries, mutations, and nested relationships.
- Create a **gRPC API** for internal service communication.
- Compare **REST vs GraphQL vs gRPC**.

## □ Microservices & API Gateways

- Create an **API Gateway** using Express/Nginx/Kong.
- Setup **service discovery** with Consul or Eureka.
- Handle **cross-service authentication** with OAuth2 + introspection.

## □ Pagination, Filtering, Sorting

- Build **cursor-based pagination**.
- Add **filters** using query parameters.
- Add **sorting** using dynamic keys.

## □ Performance & Monitoring

- Perform **load testing** with Postman, JMeter, or k6.
- Analyze **latency vs throughput trade-offs**.
- Add **prometheus metrics endpoints**.
- Integrate **API tracing (OpenTelemetry)**.

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## □ Capstone Projects (Choose 2–3)

- Build a **Multi-Tenant SaaS API** for project management.
  - Design a **Banking Transaction API** (internal service calls + validation + audit trail).
  - Build a **Food Delivery API** with restaurant search, cart, order, delivery.
  - Develop a **Healthcare API** for appointment booking, EHR access, and patient login.
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## □ Tools & Technologies

- **Languages:** Python (FastAPI), Node.js (Express/Nest), Java (Spring Boot), Go



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- **Standards:** OpenAPI, OAuth2, REST, gRPC
- **Documentation:** Swagger UI, Redoc, Postman Collections
- **Monitoring:** Prometheus, Jaeger, ELK Stack
- **Testing:** Postman, k6, Newman, REST Assured