

## ★ Next.js – Complete Syllabus

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### ■ Module 1: Introduction to Next.js

- What is Next.js? Why it's the #1 React Framework
  - Evolution: Next.js
  - Understanding:
    - SPA vs SSR vs SSG vs ISR vs PPR
    - React Server Components (RSC)
    - React Compiler
  - Installing Node.js, pnpm, npm, yarn
  - Creating your first Next.js app (create-next-app)
  - Project Structure Overview
  - Running dev and production builds
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### ■ Module 2: Core Concepts of Next.js

- Pages Router vs App Router (why Pages Router is legacy)
  - App Directory Architecture
  - Server Components vs Client Components
  - When to use Client Components
  - Layouts, Nested Layouts, Templates
  - Route Groups ( )
  - File Naming Conventions in App Router
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### ■ Module 3: Next.js Routing System

- Basic Routing
  - Dynamic Routes [id]
  - Catch-all Routes [...slug]
  - Parallel Routes (@parallel)
  - Intercepting Routes (.)
  - Loading UI (loading.js)
  - Error Handling (error.js)
  - Not Found Handling (not-found.js)
  - Redirects, Rewrites
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### ■ Module 4: Styling in Next.js

- Global CSS
  - CSS Modules
  - SCSS / SASS
  - Tailwind CSS integration (recommended)
  - Styled-components
  - Using ShadCN UI (UI library standard)
  - Dark mode & theme switching
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### ■ Module 5: Data Fetching in Next.js

*(Based on Server Components)*

- The improved fetch()
  - Static vs Dynamic Fetching
  - Revalidation & caching
  - Route segment configuration
  - Error & loading states
  - Server-side streaming
  - Partial Prerendering (PPR)
  - Using Suspense for async data
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### ■ Module 6: Server Actions

- What are Server Actions?
  - Running functions on the server automatically
  - Using useFormState() + Server Actions
  - Form submissions without API routes
  - Revalidation after actions
  - File uploads with Server Actions
  - Authentication with Server Actions
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### ■ Module 7: API Routes & Backend with Next.js

- Route Handlers (route.js)
  - GET, POST, PUT, DELETE APIs
  - JSON request & response
  - Handling server errors
  - Creating REST APIs directly in Next.js
  - Edge API Routes
  - Middleware for:
    - Authentication
    - IP Blocking
    - Logging
    - Rate Limiting
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### ■ Module 8: Database Integration

#### MongoDB

- Connecting Next.js to MongoDB
- CRUD with Mongoose

#### PostgreSQL / MySQL

- Prisma ORM (industry standard)
- Schema modeling
- Migrations
- CRUD operations

#### Serverless Databases

- PlanetScale
  - Neon
  - Supabase
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### ■ Module 9: Authentication & Authorization NextAuth.js

- Credentials login
- OAuth providers (Google, GitHub, LinkedIn)
- JWT + Sessions
- Role-based access
- Middleware protection
- Protecting pages, layouts & routes
- Logging out on server

### ■ **Module 10: State Management in Next.js**

- Context API
- Redux Toolkit
- Zustand (lightweight modern store)
- React Query (TanStack Query)
- Server vs Client State Best Practices
- When NOT to use Redux

### ■ **Module 11: File Uploads & Media Handling**

- File uploads using:
  - Server Actions
  - Route Handlers
- Cloud Uploads:
  - Cloudinary
  - AWS S3
  - UploadThing
- Image optimization (next/image)
- Video optimization

### ■ **Module 12: Testing in Next.js**

- Jest setup for RSC + Client Components
- React Testing Library
- API route testing
- Server Action testing
- Mocking fetch()
- End-to-end testing with Cypress / Playwright

### ■ **Module 13: Middleware & Security**

- What is Middleware in Next.js?
- Protecting routes
- CORS handling
- Rate limiting
- User-agent blocking
- Adding security headers
- Preventing XSS, CSRF, Clickjacking

### ■ **Module 14: Caching, Performance & SEO**

- Full caching architecture in Next.js
- React Compiler optimization

- Turbopack improvements
- Client/Server boundaries
- Preloading strategies
- Dynamic vs Static rendering
- Using next/font for optimization
- Metadata API for SEO
- Sitemap & robots.txt generation

### ■ **Module 15: Internationalization (i18n)**

- Built-in Next.js i18n
- Locale-based routing
- Language switcher
- Dynamic translations using JSON
- RTL support

### ■ **Module 16: Deployment & DevOps (Optional)**

- Production builds
- Environment variables (dev, staging, prod)
- Deploying on:
  - Vercel (official platform)
  - Netlify
  - Render
  - AWS
  - Docker
- CI/CD pipelines (GitHub Actions)
- Monitoring and logging

### ■ **Module 17: GraphQL with Next.js (Optional)**

- Apollo Client setup
- GraphQL queries & mutations
- Building GraphQL APIs using Route Handlers

### ■ **Module 18: Real-time Apps (Optional)**

- Using Pusher
- Using Socket.io with Next.js Edge
- Real-time notifications
- Live chat functionality

### ■ **Module 19: AI Integration in Next.js (Optional)**

- Using OpenAI APIs
- Streaming AI responses
- Integrating LangChain
- AI chat components
- AI-powered search

### ■ **Module 20: Capstone Project**

Build a complete production-grade application:

**Includes:**

- App Router & RSC
- Authentication (NextAuth.js)
- Server Actions
- Prisma + PostgreSQL/MongoDB
- CRUD operations
- File uploads
- Admin Dashboard
- Caching & ISR/PPR
- SEO optimization
- Deployment on Vercel

**Example Projects:**

- E-commerce Store
  - LMS (Learning Management System)
  - Social Media Platform
  - Real-Time Chat App
  - Job Portal
  - SaaS Dashboard
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