Guide2Code - TypeScript Programming Roadmap

🔷 Phase 1: Beginner Level

📌 Topics to Learn:

1. Introduction to TypeScript (Setup, Installing TypeScript, tsconfig.json)
2. Basic Type Annotations (string, number, boolean, any, unknown)
3. Type Inference & Type Assertions
4. Variables & Data Types (let, const, var)
5. Functions (Typed Parameters, Return Types, Optional & Default Parameters)
6. Arrays & Tuples (Fixed & Dynamic Types, Readonly Arrays)
7. Objects & Interfaces (Defining, Extending, Optional & Readonly Properties)
8. Control Flow & Loops (if-else, switch-case, for, while, do-while)
9. Enums (String & Numeric Enums, Using Enums in Functions)
10. Compiling & Running TypeScript Code (tsc, ts-node)

🚀 Beginner Project Ideas:

- 📟 **Simple Calculator** – Perform basic arithmetic operations
- 📊 **Student Grade Calculator** – Input marks and display grades
- 🔢 **Number Guessing Game** – User guesses a number, program gives hints
- 🌡 **Temperature Converter** – Convert Celsius ↔ Fahrenheit
- 📅 **Age Calculator** – Calculate age based on birth year
- ⏰ **Digital Clock** – Display real-time updating clock

🔷 Phase 2: Intermediate Level

📌 Topics to Learn:

1. Advanced Types (Union, Intersection, Literal, Mapped Types)
2. Generics (Functions, Interfaces, Classes with Type Parameters)
3. Object-Oriented Programming (Classes, Interfaces, Abstract Classes, Inheritance)
4. TypeScript Modules & Namespaces (Import/Export, Module Resolution)
5. Asynchronous TypeScript (Promises, async-await, Error Handling)

6. Working with APIs (Fetch API, Axios, JSON Parsing)
7. Decorators (Class, Method, Property, Parameter Decorators)
8. Type Guards & Type Narrowing (typeof, instanceof, Type Predicates)
9. Working with DOM & Events (Event Listeners, Type-Safe Event Handling)
10. TypeScript with Node.js (Express.js, File System, Database Access)

🚀 Intermediate Project Ideas:

- 📚 **Library Management System** – Store and manage books
- 📞 **Contact Management System** – Add, edit, delete contacts
- 📑 **To-Do List App** – Task management using Local Storage
- 🌦 **Weather App** – Fetch and display live weather data from an API
- 🎮 **Tic-Tac-Toe Game** – Playable in the browser
- 🏪 **E-commerce Cart System** – Add/remove items with Local Storage

🔷 Phase 3: Advanced Level

📌 Topics to Learn:

1. TypeScript with Frontend Frameworks (React, Vue, Angular)
2. State Management in TypeScript (Redux Toolkit, Zustand, Vuex)
3. Full-stack Development with TypeScript (Node.js, Express, MongoDB/PostgreSQL)
4. Authentication & Security (JWT, OAuth, Firebase Auth)
5. WebSockets & Real-time Communication (Socket.io)
6. Performance Optimization & Best Practices (Code Splitting, Lazy Loading)
7. GraphQL with TypeScript (Apollo Client, TypeORM)
8. Deployment & CI/CD (Docker, Vercel, Netlify, AWS)
9. Microservices Architecture & API Gateway (RESTful & GraphQL APIs)
10. Testing in TypeScript (Jest, Cypress, Playwright)

🚀 Advanced Project Ideas:

- 💬 **Chat Application** – Real-time messaging with WebSockets
- 🏪 **Full-Stack E-commerce Website** – MERN Stack with authentication
- 📊 **Stock Market Tracker** – Fetch and visualize stock data with D3.js

- 🔒 **Secure Login System** – OAuth, JWT authentication with PostgreSQL
- 🎮 **Multiplayer Game** – Browser-based game using TypeScript & Socket.io
- 📈 **AI-Powered Chatbot** – TypeScript NLP chatbot