# Mastering Typescript

#### 1. **Introduction to TypeScript**

* What is TypeScript?
* Why Use TypeScript?
* Setting up TypeScript
  + Installing TypeScript (CLI & VSCode)
  + Setting up a TypeScript Project
* Compiling TypeScript to JavaScript

#### 2. **Basic TypeScript Features**

* Type Annotations
  + Number, String, Boolean, and other primitives
* Type Inference
* Arrays and Tuples
* Enums
* Interfaces vs. Types
* Union and Intersection Types
* Type Aliases

#### 3. **Functions in TypeScript**

* Function Types
* Optional and Default Parameters
* Rest Parameters
* Function Overloading
* Arrow Functions and Typing

#### 4. **Object-Oriented Programming with TypeScript**

* Classes and Constructors
* Readonly, Private, and Public Modifiers
* Inheritance and Extending Classes
* Abstract Classes
* Interfaces with Classes
* Getters and Setters
* Static Properties and Methods
* Access Modifiers: protected, private, and public

#### 5. **Advanced Types and Features**

* Generics
  + Generic Functions
  + Generic Interfaces and Classes
* Conditional Types
* Mapped Types
* Utility Types (Partial, Pick, Omit, etc.)
* Type Guards
* Literal Types and String Literal Types

#### 6. **Modules and Namespaces**

* Working with ES Modules
  + Import/Export Syntax
* TypeScript Modules vs. JavaScript Modules
* Namespaces (older TypeScript module system)
* Organizing Code with Modules

#### 7. **TypeScript and JavaScript Interoperability**

* Using TypeScript with Existing JavaScript Code
* Ambient Declarations
* Working with 3rd Party JavaScript Libraries
* Type Definitions (.d.ts files)
* @types packages from DefinitelyTyped

#### 8. **Asynchronous Programming in TypeScript**

* Promises in TypeScript
* Async/Await
* Typing Asynchronous Functions
* Handling Errors in Asynchronous Code

#### 9. **TypeScript Configuration and Tooling**

* The tsconfig.json File
  + Important Compiler Options
* Working with Linters (TSLint, ESLint)
* Code Formatting Tools (Prettier)
* Debugging TypeScript in IDEs (VSCode Debugger)
* Running TypeScript in Node.js

#### 10. **TypeScript and Frameworks**

* TypeScript with React
  + Typing Props and State
  + TypeScript with React Hooks
* TypeScript with Angular
* TypeScript with Vue.js
* TypeScript with Express (Node.js)

#### 11. **Testing in TypeScript**

* Writing Unit Tests in TypeScript
* Testing Libraries and Frameworks (Jest, Mocha)
* Type Assertions in Tests
* Mocking and Stubbing in TypeScript Tests

#### 12. **Advanced Patterns in TypeScript**

* Decorators
  + Method, Property, and Class Decorators
* Mixins in TypeScript
* Dependency Injection
* Design Patterns in TypeScript
  + Singleton, Factory, etc.
* Structural Typing vs. Nominal Typing

#### 13. **TypeScript Best Practices**

* Enforcing Strict Type Checking
* Codebase Refactoring in TypeScript
* Handling Large TypeScript Projects
* Error Handling in TypeScript
* Performance Considerations in TypeScript

#### 14. **TypeScript in the Real World**

* Building and Deploying TypeScript Projects
* TypeScript and Microservices
* Integrating TypeScript with CI/CD Pipelines
* TypeScript in Serverless Architectures

#### 15. **TypeScript for Libraries and APIs**

* Writing TypeScript Libraries
* Publishing TypeScript Projects
* Creating .d.ts Type Definition Files for Libraries
* Building APIs with TypeScript (GraphQL, REST APIs)

#### 16. **Mastering TypeScript: Advanced Techniques**

* Advanced Generics
  + Constraints, Default Parameters, and Conditional Types
* Recursive Types
* TypeScript Compiler API
* Building Custom TypeScript Transformers
* Meta-programming in TypeScript

This progression moves from basic types and concepts to complex patterns, async programming, and mastery-level topics like custom transformers and TypeScript's compiler API, covering all levels from beginner to hero!

#software/languages/typescript