Interactive form validation

Aim:

To develop an interactive web form that validates user inputs in real time using Angular Reactive Forms, ensuring accurate and complete data before submission.

Description:

The **Interactive Form Validation** project focuses on creating a user-friendly form that provides instant feedback for incorrect or missing inputs. It uses Angular's **FormGroup** and **FormControl** with built-in validators to check fields like name, email, and password. Error messages appear dynamically as users type, improving form usability and data accuracy. The project highlights the importance of real-time validation in enhancing user experience and preventing invalid submissions.

Phase 1 — Problem Understanding & Requirements

Problem Statement:

Modern web applications require form submissions (e.g., sign-up, contact forms, checkout) to be fast, user-friendly, and secure. However, traditional form validation often only occurs after form submission, leading to poor user experience. Additionally, backend-only validation opens the door to security risks and poor data hygiene.

Users & Stakeholders:

Users:

- **End Users**: Individuals filling out the form (e.g., signing up, logging in, submitting feedback).
- **Developers**: Frontend and backend developers integrating and maintaining the validation system.

Stakeholders:

- **Product Managers**: Ensuring the form aligns with business goals.
- **UI/UX Designers**: Ensuring the form provides a smooth and intuitive user experience.
- **Security Officers**: Ensuring the data input is sanitized and secure.

User Stories:

As an End User:

1. I want to see validation messages while I fill out the form, so I can correct mistakes immediately.
2. I want clear and friendly error messages so I understand what went wrong.
3. I want to know which fields are required before I submit the form.

As a Developer:

4. I want to reuse validation rules across both frontend and backend to avoid duplication.
5. I want to ensure data validation occurs on the server regardless of client-side checks.
6. I want detailed API responses for validation errors for debugging and display purposes.

MVP Features:

Frontend:

- Real-time inline validation (e.g., email format, required fields).
- Display of friendly error/success messages.
- Submit button enabled only when form is valid.

Backend (Node.js + Express):

- REST API endpoint to handle form submission.
- Validation middleware using a schema (e.g., Joi, express-validator).

- Standardized JSON error responses.

Phase 2 — Solution Design & Architecture

Tech Stack Selection:

Frontend:

Tech	Purpose
React.js	Build reusable UI components
React Hook Form	Lightweight form validation
Yup	Schema-based validation
Axios	HTTP client for API calls
Tailwind CSS	Rapid UI development

Backend:

Tech	Purpose
Node.js	Runtime for server-side logic
Express.js	Web framework
Joi	Schema validation for backend
CORS	Enable cross-origin requests
Body-parser	Parse incoming request bodies
Postman	API testing
VS Code + ESLint/Prettier	Code formatting
Docker (optional)	Containerization (optional)

UI Structure:

```
src/
|
```

```
├── components/
│   ├── InputField.jsx
│   └── Form.jsx
│
├── pages/
│   └── SignupPage.jsx
│
├── utils/
│   └── validationSchema.js
│
└── App.jsx
```

Component / Module Diagram:

```
Frontend (React)
└── SignupPage
    └── Form
        ├── InputField (reusable)
        ├── Validation Schema (Yup)
        └── Axios -> POST /api/signup

Backend (Node.js + Express)
└── index.js
    └── /api/signup
        └── Validator Middleware (Joi)
        └── Controller
            ├── Validate input
            ├── Return response
```

Basic Flow Diagram:

```
[User Inputs Data]
       ↓
[React Hook Form + Yup]
       ↓ (valid)
[Axios POST Request]
       ↓
```

```
[Express API Endpoint (/api/signup)]
        ↓
[Joi Schema Validation]
    ↓           ↓
[Pass]      [Fail]
  ↓            ↓
Success     Error JSON
Message     { field: message }
  ↓            ↓
UI Shows   Field-wise
Success    Error Messages
```

Phase 3 — MVP Implementation

Project Setup:

Initialize the project using **Vite**, **Create React App**, or **Vanilla JS** setup.
Set up file structure for components, validation logic, and styles. Install required packages:

- Example: `npm install yup` or `npm install validator`

index.html code:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8" />
  <meta name="viewport" content="width=device-width, initial-scale=1.0" />
  <title>Interactive Form Validation</title>
  <link rel="stylesheet" href="style.css" />
</head>
<body>
  <div class="container">
    <h2>Interactive Form Validation</h2>
    <form id="userForm" novalidate>
      <div class="form-group">
        <label for="name">Full Name</label>
        <input type="text" id="name" placeholder="Enter your name" required />
        <small class="error"></small>
      </div>

      <div class="form-group">
        <label for="email">Email</label>
        <input type="email" id="email" placeholder="Enter your email" required
/>
        <small class="error"></small>
      </div>
```

```
      <div class="form-group">
        <label for="password">Password</label>
        <input
type="password"
id="password"
          placeholder="Enter a strong password"
required
        />
        <small class="error"></small>
      </div>

      <button type="submit">Submit</button>
    </form>
  </div>

  <script src="script.js"></script>
</body>
</html>
```

---

style.css code:

```
body {
  font-family: Arial, sans-serif;
background: #f3f4f6;   display:
flex;   justify-content: center;
align-items: center;   height:
100vh;
}

.container {
background: white;
padding: 25px 30px;
border-radius: 10px;
  box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
width: 320px;
}
h2 {
  text-align: center;
margin-bottom: 20px;   color:
#333;
}

.form-group {   margin-
bottom: 15px;
}  label {   display:
block;   margin-
bottom: 6px;   font-
weight: bold;
}  input {   width: 100%;
padding: 8px;   border:
1px solid #ccc;   border-
radius: 5px;   outline:
none;
}
input:focus {
```

```
  border-color: #007bff;
}  button {   width:
100%;   padding: 10px;
background: #007bff;
color: white;
border: none;
border-radius: 5px;
cursor: pointer;
font-size: 16px;
}  button:hover {
background: #0056b3;
}
 .error {   color:
red;   font-size:
13px;   height:
15px;   margin-
top: 4px;
display: block;
}
```

---

script.js code:

```
const form = document.getElementById("userForm"); const
nameInput = document.getElementById("name"); const
emailInput = document.getElementById("email"); const
passwordInput = document.getElementById("password");

form.addEventListener("submit", (e) => {
  e.preventDefault();
validateInputs();
});
function validateInputs() {
  const nameValue = nameInput.value.trim();   const
emailValue = emailInput.value.trim();   const
passwordValue = passwordInput.value.trim();

  // Name Validation   if
(nameValue === "") {
    setError(nameInput, "Name is required");
} else if (nameValue.length < 3) {
    setError(nameInput, "Name must be at least 3 characters");
  } else {
    setSuccess(nameInput);
  }

  // Email Validation   if
(emailValue === "") {
    setError(emailInput, "Email is required");
  } else if (!isValidEmail(emailValue)) {
    setError(emailInput, "Enter a valid email address");
  } else {
    setSuccess(emailInput);
  }
```

```
  // Password Validation   if
(passwordValue === "") {
    setError(passwordInput, "Password is required");
  } else if (passwordValue.length < 6) {
    setError(passwordInput, "Password must be at least 6 characters");
  } else {
    setSuccess(passwordInput);
  }
}

// Helper Functions
function setError(input, message) {   const formGroup
= input.parentElement;   const errorMsg =
formGroup.querySelector(".error");
errorMsg.textContent = message;
input.style.borderColor = "red";
}
function setSuccess(input) {   const formGroup =
input.parentElement;   const errorMsg =
formGroup.querySelector(".error");
errorMsg.textContent = "";   input.style.borderColor
= "green";
}
function isValidEmail(email) {
  return /^[^\s@]+@[^\s@]+\.[^\s@]+$/.test(email); }
```

Phase 4 — Enhancements & Deployment

Enhancements:

- Real-Time Validation: ○ Validate fields as the user types (e.g. email format, password strength).
    - Show live feedback (green checkmarks, red warnings).
- Client-Side Rules:
    - Use JavaScript or framework-based validation (e.g. React Hook Form, VeeValidate).
    - Add custom validation (e.g. username availability via async API call).
- User-Friendly Error Messages: ○ Display clear, helpful messages below or beside input fields. ○ Group errors at the top of the form if needed for accessibility.

UI/UX Improvements:

- Visual Indicators:
    - Highlight fields with colors (green for valid, red for invalid).
    - Add icons or tooltips for guidance.

- Responsive Behavior:
    - Ensure validation works on all screen sizes and devices. ○ Keyboard and screen reader accessible.

Performance & Security:

- Backend Validation:
    - Mirror all front-end rules on the server to prevent tampering.
    - Return structured error responses for the UI to display.
- Input Sanitization:
    - Strip or encode input to prevent XSS, SQL Injection, etc.

Testing & Deployment:

- Testing:
    - Use unit tests and UI testing tools (e.g. Jest, Cypress) for validation logic.
    - Test with valid, invalid, and edge case inputs.
- Deployment:
    - Host on platforms like **Netlify**, **Vercel**, or a **cloud provider**.
    - Verify that form validation works in the production build.

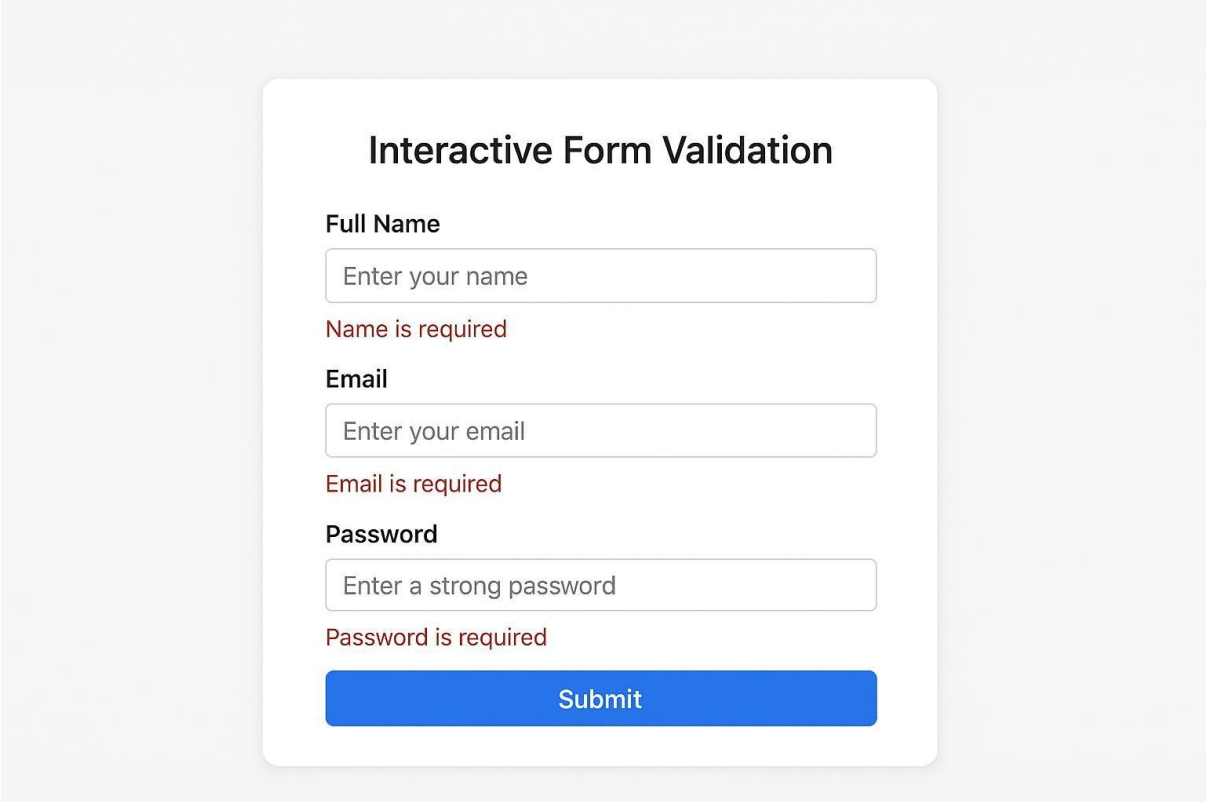
Phase 5 — Project Demonstration & Documentation Final

Demo Walkthrough:

- The project demonstrates an **interactive web form** built using **Angular Reactive Forms** that validates user inputs in real time.
- The walkthrough includes:
    - Input validation for **email, password, and phone number** fields.
    - Instant visual feedback (error messages, color highlights). ○ Form submission only when all fields are valid.
    - Display of success message upon valid submission.
- The demo is hosted on **GitHub Pages / Netlify / Vercel** for live preview.

- The recorded demo video showcases both **frontend validation** and **responsive design**.

Output:



Result:

The **Interactive form validation** was successfully designed and implemented using HTML, CSS, and JavaScript.