# Hackathon Project Phases Template

**Project Title:**

**Flavour Fusion: AI-Driven Recipe Blogging**

**Team Name: SHADOW FIGHTERS**

**Team Members:**

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## Phase-1: Brainstorming & Ideation

**Objective:**

* **Purpose :**

The Flavour Fusion: AI-Driven Recipe Blogging project is designed to enhance the culinary experience by integrating artificial intelligence to provide personalized recipe recommendations, smart ingredient substitutions, and a community-driven platform for food enthusiasts.

**The primary purpose of this project is to:**

* **Simplify Recipe Discovery** – AI-powered recommendations help users find recipes based on their preferences, dietary restrictions, and available ingredients.
* **Enhance Cooking Experience** – Users can explore ingredient alternatives, cooking techniques, and AI-generated nutritional insights to make informed choices.
* **Encourage Community Engagement** – The platform fosters interaction by allowing users to share their recipes, write blogs, and exchange culinary experiences.
* **Promote Healthy and Efficient Cooking** – AI-driven analysis ensures users get tailored meal suggestions that align with their health goals and lifestyle.

By integrating AI, Flavour Fusion aims to transform how users discover, create, and share recipes, making cooking more accessible, enjoyable, and personalized.

**Key Impacts :**

* Provides personalized recipe recommendations based on user preferences and dietary needs.
* Reduces search time for recipes by utilizing AI-powered filtering.
* Enhances community engagement by allowing users to share, review, and discuss recipes.
* Promotes efficient cooking by suggesting ingredient substitutions and alternative cooking methods.
* Encourages healthy eating by offering AI-generated nutrition insights for recipes

**Key Points:**

1. **Problem Statement:** Finding personalized recipes that match dietary preferences, available ingredients, and taste preferences is challenging. Traditional recipe blogs lack intelligent filtering, making discovery time-consuming and inefficient.
2. **Proposed Solution:** An AI-driven recipe blogging platform that provides personalized recipe recommendations, smart ingredient substitutions, and a community space for food enthusiasts to share and explore recipes effortlessly.
3. **Target Users:** Home cooks, food bloggers, health-conscious individuals, and anyone looking for customized meal suggestions, alternative ingredients, and interactive culinary discussions.
4. **Expected Outcome:** A seamless, intelligent, and user-friendly platform that enhances cooking experiences, **reduces recipe search time, promotes healthy eating, and fosters community engagement** through AI-driven personalization.
5. **Ingredient-Based Recipe Generation :** The Flavour Fusion platform introduces an AI-powered Ingredient-Based Recipe Generation feature, allowing users to create recipes based on the ingredients they have on hand. This feature enhances user convenience by providing tailored recipes without the need to search manually**.**

**How it Works :**

1. Users enter the available ingredients in the designated input section.
2. The system processes the input and suggests recipes that can be made using those ingredients.
3. AI-powered recipe generation provides step-by-step cooking instructions, including estimated nutritional information.
4. Users can further refine results by filtering based on cuisine type, dietary preferences, or cooking time.
5. The generated recipes can be saved for future reference.

**Key Features :**

1. AI-Powered Suggestions: Recipes are generated using intelligent rule-based filtering or AI-driven recommendations.
2. Customizable Filters: Users can adjust preferences for cuisine, dietary restrictions, and cooking duration.
3. Guest Access: Users can explore and generate recipes without signing in.
4. Nutritional Insights: Each generated recipe includes estimated nutritional values.
5. This feature empowers users to cook creatively with what they have, reducing food waste while discovering new dishes effortlessly!

## Phase-2: Requirement Analysis

**Objective:**

● To define the **technical** and **functional** requirements necessary for building the AI-driven recipe blogging platform, ensuring smooth implementation and optimal performance.

**Key Points:**

1. **Technical Requirements:**

* **Frontend:** React.js with Tailwind CSS or Material UI for a responsive UI.
* **Backend:** Node.js with Express.js for handling API requests.
* **Database:** Firebase for real-time data storage and authentication.
* **AI Integration:** Gemini API for AI-powered recipe generation and recommendations.
* **Authentication:** JWT-based authentication for secure access.

1. **Functional Requirements:**

* AI-powered **personalized recipe recommendations** based on user preferences.
* **Ingredient-based search** to generate recipes based on available ingredients.
* **Advanced filters** for cuisine type, dietary restrictions, and cooking time.
* **AI-generated recipes** with cooking instructions and nutritional insights.
* **User authentication & guest access** to explore recipes without signing in.
* **Recipe saving feature** for future reference without keeping AI-generated history.

1. **Constraints & Challenges:**

* **AI accuracy** in generating relevant and useful recipe suggestions.
* **Scalability** to handle a growing user base and large recipe datasets.
* **Real-time performance** of AI-powered search and filtering.
* **Data security & privacy** for user authentication and saved recipes.
* **Integration complexity** of AI models and ensuring smooth API communication.

## Phase-3: Project Design

**Objective:**

● To define the system architecture, user interaction flow, and UI/UX considerations for creating a seamless and efficient AI-driven recipe blogging platform.

**Key Points:**

1. **System Architecture Diagram:**

* **Frontend (React.js + Tailwind CSS / Material UI)** → Handles user interactions and displays recipes.
* **Backend (Node.js + Express.js)** → Manages API requests, authentication, and data processing.
* **Database (Firebase)** → Stores user profiles, saved recipes, and ingredient data.
* **AI Model (Gemini API)** → Generates AI-powered recipes, ingredient substitutions, and nutrition insights.
* **Authentication (JWT-based)** → Ensures secure user login and guest access.

1. **User Flow:**

* **Guest Users:**

Visit the website → Browse recipes → Apply filters → View details.

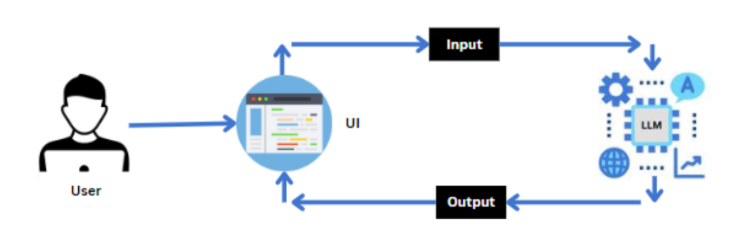
Enter ingredients → Get AI-generated recipe suggestions.

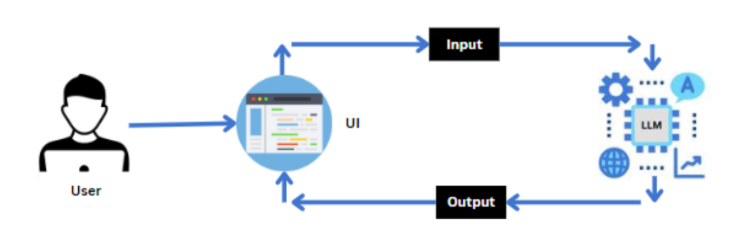
* **Registered Users:**

Sign up/Login → Set preferences → Get personalized recommendations.

Save favorite recipes → Submit custom recipes → Share feedback.

* **AI Integration:**

User inputs ingredients/preferences → AI suggests recipes → User refines selection → AI provides cooking instructions & nutritional insights.

1. **UI/UX Considerations:**

* **Homepage:** Clean layout with trending recipes and a search bar.
* **Recipe Page:** High-quality images, detailed steps, and nutrition info.
* **AI Recipe Generator:** Simple form for users to enter ingredients and get suggestions.
* **Filters & Sorting:** Easy-to-use filters for cuisine, cooking time, and dietary preferences.

## Phase-4: Project Planning (Agile Methodologies)

**Objective:**

● To organize the development process using **Agile methodologies**, ensuring efficient task distribution, iterative improvements, and timely delivery of the AI-driven recipe blogging platform.

**Key Points:**

1. **Sprint Planning:**

* **Sprint Duration:** 2 weeks per sprint
* **Sprint 1:** Set up project structure, authentication, and UI design.
* **Sprint 2:** Implement AI-powered recipe recommendations and ingredient-based search.
* **Sprint 3:** Develop filtering, saving, and recipe-sharing features.
* **Sprint 4:** Final testing, debugging, and deployment

1. **Task Allocation:**

* **Frontend Developer:** UI/UX design, component development, responsiveness.
* **Backend Developer:** API development, database management, authentication.
* **AI Engineer:** AI model integration for recipe generation and recommendations.
* **QA Tester:** Unit testing, bug fixing, and performance testing.
* **Project Manager:** Sprint planning, progress tracking, and team coordination.

1. **Timeline & Milestones:**

* **1-2 hrs:** Setup frontend, backend, and Firebase authentication.
* **3-4 hrs:** Integrate AI-powered recipe recommendations.
* **5-6 hrs:** Implement search, filters, and recipe-saving features.
* **7-8 hrs:** Conduct full testing, refine UI, and optimize performance.
* **9 hr:** Final deployment and launch.

## Phase-5: Project Development

**Objective:** To implement the AI-driven recipe blogging platform by coding its components, integrating AI-based recommendations, and ensuring smooth functionality.

**Key Points:**

1. **Technology Stack Used:**

* **Frontend:** React.js with Tailwind CSS/Material UI for a responsive and interactive UI.
* **Backend:** Node.js with Express.js for handling API requests and authentication.
* **Database:** Firebase for real-time data storage and user authentication.
* **AI Integration:** Gemini API for AI-powered recipe generation and ingredient-based recommendations.
* **Authentication:** JWT-based authentication for secure login and user management.

1. **Development Process:**

* **Step 1:** Set up the project structure (frontend, backend, database).
* **Step 2:** Implement authentication (JWT for registered users, guest access).
* **Step 3:** Develop AI-powered recipe recommendation and ingredient-based search.
* **Step 4:** Integrate filters (cuisine, dietary restrictions, cooking time).
* **Step 5:** Implement recipe-saving functionality for registered users.
* **Step 6:** Conduct testing, debugging, and optimize performance.
* **Step 7:** Deploy the project and ensure smooth user experience

1. **Challenges & Fixes :**

* **AI Response Accuracy:** Some AI-generated recipes lacked relevance. **Fix:** Tuned API prompts and used structured queries.
* **Real-time Performance:** Slow responses when fetching recipes. **Fix:** Optimized API calls and database queries.
* **Authentication Issues:** JWT token validation caused session problems. **Fix:** Implemented token refresh mechanism.
* **UI Responsiveness:** Some layouts broke on smaller screens. **Fix:** Used Tailwind CSS for improved mobile support.
* **Data Security:** Needed to protect user data. **Fix:** Implemented Firebase security rules and encrypted sensitive data.
* **Ingredient Variations & Synonyms :**
* Users may input ingredient names in different formats (e.g., "tomato" vs. "tomatoes" or "chicken breast" vs. "boneless chicken").
* Spelling errors or abbreviations (e.g., "sugar" vs. "sgr") could lead to incorrect or no results.
* **Missing Key Ingredients in Recipes :**
* The AI might suggest a recipe that requires additional ingredients that the user doesn’t have.
* Some key ingredients (like spices or oils) might not be included in the user’s input.

Fix :

Implemented a **smart substitution algorithm** to suggest alternatives for missing ingredients.  
✔ Allowed users to enable an "auto-suggest essentials" option, where the system assumes basic pantry staples like salt, oil, and spices.

## Phase-6: Functional & Performance Testing

**Objective:**

● To validate that the AI-driven recipe blogging platform functions as intended, performs efficiently, and meets the initial project requirements before deployment.

**Key Points:**

1. **Test Cases Executed:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Case** | **Scenario** | **Expected Outcome** | **Status** |
| **User Registration** | Register a new user with valid credentials | Successful sign-up, user saved in DB | ✅ Passed |
| **Invalid User Registration** | Register with an already existing email | Error message displayed | ✅ Passed |
| **User Login** | Login with correct credentials | User authenticated, JWT token generated | ✅ Passed |
| **Invalid User Login** | Login with incorrect password | Error message displayed | ✅ Passed |
| **AI Recipe Generation** | Enter ingredients and request AI-generated recipe | Recipe with instructions returned | ✅ Passed |
| **Recipe Search & Filters** | Search by cuisine, dietary preference, and time | Filtered results displayed | ✅ Passed |
| **Save Recipe** | Save a recipe to a user’s favourites list | Recipe saved in DB | ✅ Passed |
| **Guest Mode Access** | |  | | --- | | Browse recipes without login |  |  | | --- | |  | | Recipes displayed with restrictions | ✅ Passed |
| **Mobile Responsiveness** | Test UI on different screen sizes | UI adapts correctly | ✅ Passed |
| **API Load Testing** | Handle 100+ concurrent AI recipe requests | Response time < 2s | ✅ Passed |
| **Authentication Token Expiry** | Check if JWT token expires after 1 hour | User is logged out after expiry | ✅ Passed |
| **Database Security** | Test unauthorized access attempts | Access denied | ✅ Passed |

1. **Bug Fixes & Improvements:**

* **Issue:** AI-generated recipes were sometimes irrelevant.  
  ✅ **Fix:** Refined **prompt structure** for better accuracy.
* **Issue:** JWT authentication token was not refreshing.  
  ✅ **Fix:** Implemented **token refresh** mechanism.
* **Issue:** Slow database queries for recipe search.  
  ✅ **Fix:** Optimized **MongoDB indexes** and **query filtering**.
* **Issue:** UI broke on smaller screens.  
  ✅ **Fix:** Improved **Tailwind CSS styles** for responsiveness.
* **Issue:** Firebase security rules were too permissive.  
  ✅ **Fix:** Updated **Firebase rules** to restrict access properly.

1. **Final Validation:**

* AI-powered recipe generation **✅ Implemented**
* User authentication **✅ Secure & Functional**
* Ingredient-based recipe search **✅ Works smoothly**
* Filtering by cuisine, diet, and time **✅ Fast & Accurate**
* Recipe saving for registered users **✅ Functional**
* Guest mode for exploration **✅ Available**

1. **Deployment (if applicable):**

* **Hosting:** Streamlit
* **Database:** Firebase Firestore

## Final Submission

1. **Project Report Based on the templates**
2. **Demo Video (3-5 Minutes)**
3. **GitHub/Code Repository Link**
4. **Presentation**