Department of Electrical and Computer Engineering
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Junior Design Project

GHURBO: Bangladesh Tour Planning and Travel Agency System

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ABSTRACT

GHURBO: Bangladesh Tour Planning and Travel Agency System

GHURBO is a modern web-based platform designed to connect travelers with reliable tour package providers. The system features a multilingual AI chatbot to assist users in selecting packages based on budget, preferences, and destination. It offers real-time booking, secure payments, and automated email confirmations.

Tour operators can register and manage packages through an easy-to-use dashboard, while travelers benefit from a responsive, device-friendly interface. Developed with React.js, Node.js, and MongoDB, and integrated with cloud services for media and notifications, GHURBO aims to simplify travel planning, enhance user experience, and promote tourism growth in Bangladesh.

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Chapter 1 Introduction

1.1 Background and Motivation

Bangladesh's tourism industry has been growing steadily, with increasing interest in its natural beauty, cultural heritage, and unique travel experiences. However, travelers often face challenges such as scattered information, lack of trustworthy booking platforms, and minimal personalization options. On the other side, many small and mid-sized tour agencies lack the tools to market their services effectively.

With the rapid growth of internet access and smartphone usage in Bangladesh, there is a strong opportunity to create a centralized, technology-driven platform that connects travelers and tour providers. GHURBO addresses these needs by combining personalized tour recommendations, a seamless booking process, and real-time management tools for package sellers. The motivation behind this project is to digitize the tourism sector, boost transparency, and make travel planning more accessible and enjoyable.

1.2 Purpose and Goal of the Project

The main purpose of GHURBO is to provide an all-in-one platform that simplifies tourism services for both travelers and tour operators. The goals are:

- To enable travelers to search, compare, and book tour packages with ease.
- To integrate a multilingual AI chatbot for guided package selection.
- To provide tour operators with a dashboard for package management and sales tracking.
- To ensure secure and reliable booking with instant email confirmations.
- To enhance Bangladesh's tourism industry through digital transformation.

The novelty of GHURBO lies in its unique combination of multilingual AI assistance, real-time package updates, and dedicated seller management tools—all integrated into a single web platform tailored for the Bangladeshi market.

1.3 Organization of the Report

- Chapter 1 introduces the background, purpose, and structure of the report.
- Chapter 2 reviews related research and identifies gaps in existing solutions.

- Chapter 3 explains the methodology, including system architecture, selected tools, and implementation steps.
- Chapter 4 presents the experiments, results, and discussions.
- Chapter 5 evaluates the societal, environmental, and sustainability impacts.
- Chapter 6 outlines the project plan and budget.
- Chapter 7 discusses the Complex Engineering Problems (CEP) and Complex Engineering Activities (CEA) addressed.
- Chapter 8 concludes the report with a summary, limitations, and recommendations for future work.

Chapter 2 Research Literature Review

2.1 Existing Research and Limitations

Several web and mobile-based tourism platforms have been developed in Bangladesh and globally, offering destination listings, hotel bookings, and basic package search. However, most existing systems lack **multilingual support**, **AI-powered personalization**, and **integrated tools for local tour operators**.

Local platforms provide basic booking features but often rely on static data, limiting real-time updates. International platforms like TripAdvisor and Booking.com offer advanced booking and review systems but are not tailored to the **Bangladeshi tourism market**, missing localized destinations, seasonal recommendations, and affordable integration for small operators.

Key Limitations Identified:

- No **AI-driven** package recommendations based on budget and preferences.
- Lack of **Bengali language support** for domestic travelers.
- Minimal **real-time management tools** for tour operators.
- Weak adaptation to **local cultural and seasonal tourism trends**.

GHURBO's Contribution:
The GHURBO platform addresses these issues by integrating a **multilingual AI chatbot**, **personalized package recommendations**, **real-time seller dashboards**, and **cloud-based booking with instant confirmations**, designed specifically for Bangladesh's tourism industry

Chapter 3 Methodology

3.1 System Design

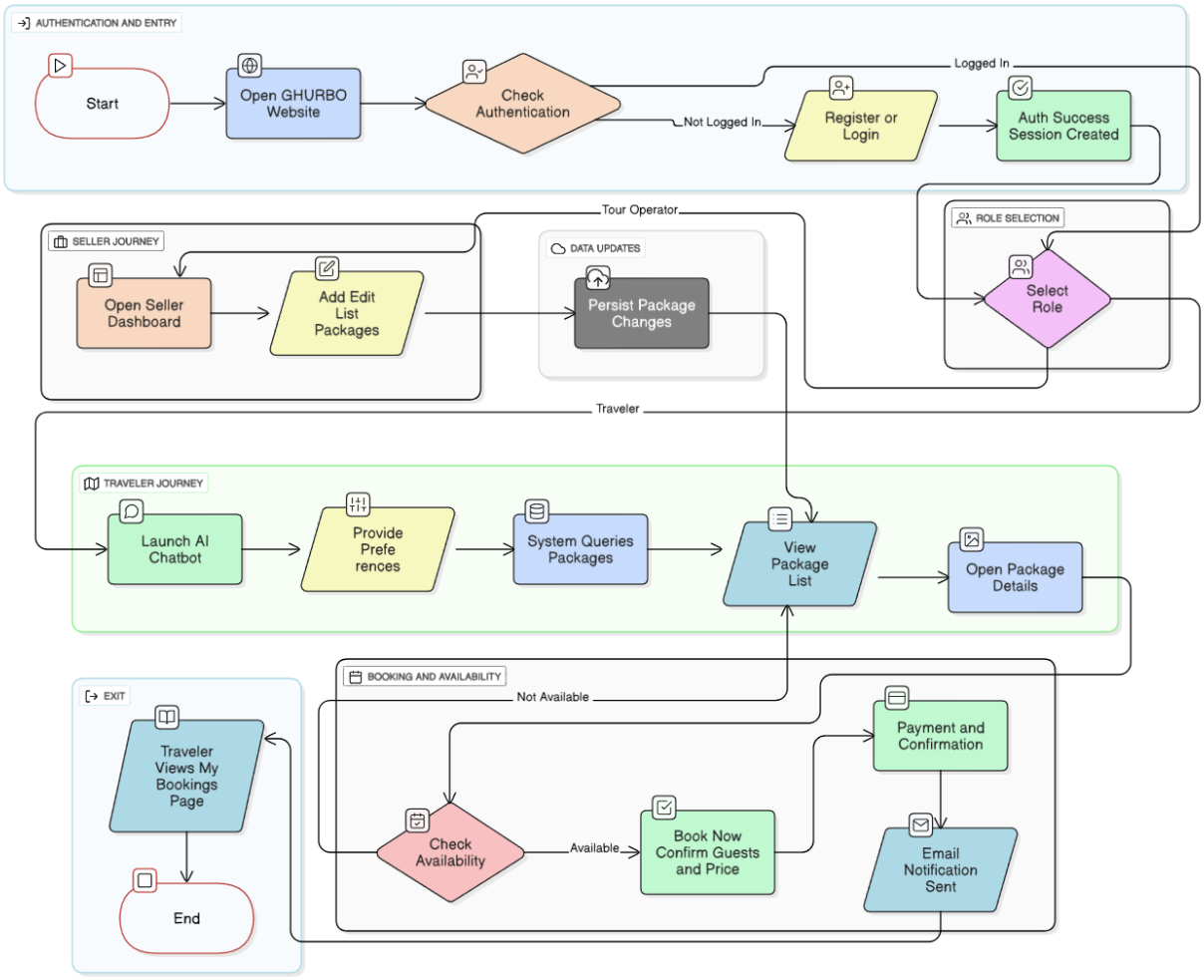

Figure 1. GHURBO System Flowchart

3.2 Hardware and/or Software Components

GHURBO is primarily a software-based project, but it utilizes various cloud services and APIs to integrate advanced features.

TABLE I. A SOFTWARE TOOLS TABLE

Tool / Technology	Functions	Other Similar Tools	Why Selected for GHURBO
React.js	Frontend framework for building dynamic user interfaces	Angular, Vue.js	High performance, reusable components, strong community support
Node.js + Express.js	Backend server and API handling	Django, Laravel	Lightweight, scalable, perfect for RESTful APIs
MongoDB Atlas	Cloud-hosted NoSQL database	MySQL, PostgreSQL	Flexible schema, cloud scalability
Cloudinary	Cloud-based media storage and delivery	AWS S3, Google Cloud Storage	Easy integration with React, automatic image optimization
Brevo	Email automation for booking confirmations	Mailgun, SendGrid	Reliable delivery, simple API
Clerk	Authentication and user management	Firebase Auth, Auth0	Easy integration, supports multi-factor auth
AI Chatbot Framework	Multilingual package recommendation chatbot	Dialogflow, Rasa	Supports Bangla and English, customizable logic
Vercel	Deployment platform for frontend and backend hosting	Netlify, AWS Amplify	Simple deployment, automatic CI/CD integration

3.3 Hardware and/or Software Implementation

The implementation process followed these steps:

- **Frontend Development:**
  - Created reusable UI components in React.js, including the chatbot interface, package cards, booking forms, and dashboards.
  - Used Tailwind CSS for responsive design, ensuring compatibility across devices.
- **Backend Development:**

- Set up Express.js routes for user authentication, package management, and booking operations.
- Integrated Cloudinary API for media uploads and Brevo API for automated emails.
- Implemented secure authentication via Clerk, supporting both password-based and social logins.

➢ **Database Setup:**

- Designed MongoDB collections for users, tour packages, bookings.
- Indexed frequently queried fields for performance optimization.

➢ **Chatbot Integration:**

- Developed a multilingual chatbot that interacts with the backend API to fetch relevant packages.
- Added intent recognition for budget-based and destination-based recommendations.

➢ **Deployment:**

- Frontend and backend deployed on Vercel with continuous deployment from GitHub.
- MongoDB Atlas hosted on the cloud for high availability.

Chapter 4 Investigation/Experiment, Result, Analysis and Discussion

The development of GHURBO involved multiple iterations of design, testing, and optimization to ensure performance, usability, and functionality.

4.1 Investigation and Experiments

The investigation phase focused on identifying core requirements through:

- Analysis of existing tourism platforms to identify gaps in personalization, seller-side tools, and multilingual support.
- Information collected from social media about local tour operators to understand their booking and management challenges.
- Web page usability testing conducted by our team members.

4.2 Experimentation Process

Experiments were conducted on three major components:

1. **Chatbot Recommendation Accuracy**
   - Tested the AI chatbot with various budget ranges, destinations, and seasonal inputs.
   - Adjusted the recommendation algorithm to ensure the highest relevance for returned packages.
2. **Booking Workflow Efficiency**
   - Simulated bookings under different scenarios (low bandwidth, high concurrent usage).
   - Measured transaction completion time and payment gateway success rate.
3. **Dashboard Responsiveness for Tour Operators**
   - Tested mobile and desktop versions for cross-device consistency.

4.3 Results

- Average booking completion time was under 15 seconds, including payment confirmation.
- Seller dashboard updates reflected on the client side in less than 5 seconds on average.
- Email Notification Delivery time was under 15 seconds.

TABLE II. SUMMARY OF KEY PERFORMANCE RESULTS			
Test Category	**Metric**	**Result**	**Target Achieved**
Booking Speed	Avg. completion time (seconds)	≈15	Yes
Dashboard Update Latency	Seconds to reflect change	≈5	Yes
Email Notification Delivery	Delivery success rate (%)	≈98%	Yes

Chapter 5 Impacts of the Project

5.1 Impact of this project on societal, health, safety, legal and cultural issues

I. **Societal:** GHURBO increases accessibility to verified tourism services, helping users make informed travel choices while supporting local tour operators in reaching broader markets.
II. **Legal:** The system complies with digital transaction and data privacy laws in Bangladesh, ensuring secure storage of personal and payment information.
III. **Cultural:** By promoting diverse destinations, GHURBO encourages cultural exchange and awareness, including less-known rural attractions, thereby helping preserve and promote cultural heritage.
IV. **Safety:** Verified tour operators and transparent package details enhance traveler safety by reducing the risk of fraudulent bookings.

5.2 Impact of this project on environment and sustainability

I. **Environmental:** While GHURBO is a software solution and has minimal direct environmental footprint, it supports eco-tourism by promoting environmentally friendly travel packages.
II. **Sustainability:** By enabling local operators to digitize their services, the platform reduces the need for physical brochures and printed advertisements, lowering paper waste.
III. **Tourism Sustainability:** GHURBO contributes to sustainable tourism by spreading demand across multiple destinations, reducing pressure on over-visited sites, and boosting economic opportunities in less-developed regions.

Chapter 6 Project Planning and Budget

6.1 Project Planning

The GHURBO project was planned over **10 weeks**, with each week focusing on specific development milestones. The plan included requirement gathering, system design, backend and frontend development, integration, testing, and final deployment.

The table below summarizes the planned tasks and actual progress:

TABLE III. PROJECT PLANNING TABLE

Week	Planned Task	Actual Progress
Week 1	Research & Requirements Gathering	Completed project scope definition, gathered requirements, and created initial design plan
Week 2	Dataset Preparation & GitHub Repository Setup	Prepared dataset and initialized GitHub repository
Week 3	Backend Logic Development (Core APIs & Authentication)	Implemented core backend logic with authentication and database connection
Week 4	Frontend Structure Setup & Initial Component Development	Set up React.js frontend structure with Tailwind CSS
Week 5	Home Page, Navigation, Tour List, and Authentication	Developed Home page, navigation bar, and authentication using Clerk
Week 6	Package Details, Bookings, and Dashboard Structure	Implemented MyBookings, PackageReg, Navbar, Sidebar, Layout, and Dashboard
Week 7	Add & List Package Features, Backend Database Integration	Built AddPackage and ListPackage components; connected frontend to backend APIs
Week 8	Backend Modules for Tours, Packages, Bookings, and Image Upload	Developed key backend modules; integrated frontend with live data
Week 9	Final Backend Fixes, UI Enhancements, and Email Integration	Resolved backend errors; added UI components like RecommendedPackages and PaymentMethod
Week 10	Testing, Bug Fixing, Content Enrichment, and Final Presentation	Conducted full testing, fixed bugs, enriched content, and prepared final demo

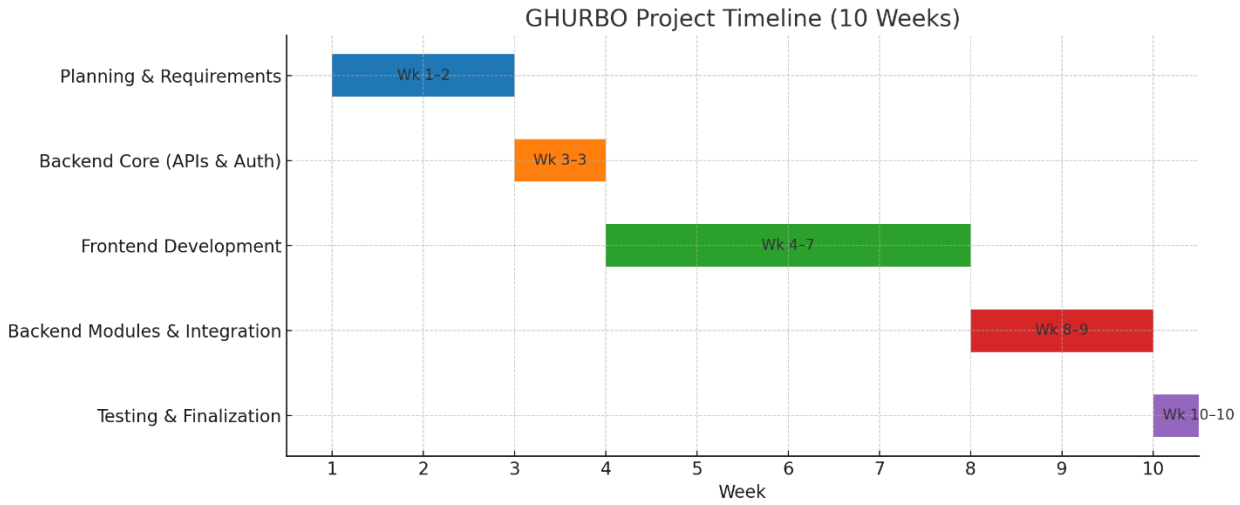

Figure 2. Project Timeline

6.2 Budget

The GHURBO project was developed without any direct financial expenditure.

- **Hosting**: Free tier deployment via Vercel and MongoDB Atlas.
- **Authentication**: Clerk free developer plan.
- **Email Services**: Brevo free-tier API.
- **Cloud Storage**: Cloudinary free-tier plan.
- **Development Tools**: All team members used free IDEs (VS Code) and open-source libraries.

Total Cost: 0 BDT

This cost-effective approach was achieved by leveraging free-tier cloud services, open-source frameworks, and in-house development efforts.

Chapter 7 Complex Engineering Problems and Activities

7.1 Complex Engineering Problems (CEP)

TABLE IV. A SAMPLE COMPLEX ENGINEERING PROBLEM ATTRIBUTES TABLE

Attributes		Addressing the complex engineering problems (P) in the project
P1	Depth of knowledge required (K3-K8)	The project requires knowledge of Electrical Circuits, Electronics (K3), Wireless Communication, Embedded System, Sensors and Instrumentations (K4), Designing and Simulation (K5), Engineering & IT (Circuit Design/Smartphone Application) Tools (K6), Involve Environmental Effects (K7), Scientific Research Papers (WK8).
P2	Range of conflicting requirements	In the prototype, the strength of the structure (mass) and capability of weightlifting (# of sensors) is directly related to the capacity of the motors.
P3	Depth of analysis required	No unique way to design. Depth of analysis needed to select a specific solution from many alternatives. (Static/mobile/drone. Various microcontrollers. Various sensors)
P4	Familiarity of issues	Various air quality sensors, Raspberry Pi/Arduino Mega/Nano/Uno/NodeMCU Microcontroller.
P5	Extent of applicable codes	There is no existing code or standard for this project.
P6	Extent of stakeholder involvement	There are several stakeholders needs to be involved including the owner of the device, installing places, Ministry of Environment, etc.
P7	Interdependence	Project involves a number of interdependent sub-systems such as microcontrollers, sensors, wireless communication system, circuit designing tools, mobile apps.

P1 – Depth of Knowledge Required (K3–K8):

The GHURBO platform required a combination of skills in frontend development (React.js, Tailwind CSS), backend development (Node.js, Express.js), database management (MongoDB Atlas), and cloud service integration (Cloudinary for media storage, Brevo for email automation). Additionally, understanding of authentication systems (Clerk), API development, and responsive

design principles was essential. The development also involved applying best practices in data security and system scalability, meeting knowledge levels from K3 to K8.

P3 – Depth of Analysis Required:

Significant analysis was required to determine the best architecture, and database schema for the platform. Multiple hosting strategies (shared, dedicated, and serverless) were evaluated, along with options for payment gateways. Trade-offs were considered for performance, cost, and scalability before selecting the final implementation strategy.

P7 – Interdependence:

GHURBO consists of multiple interdependent subsystems, including:

- Multilingual AI chatbot for package recommendations.
- Booking and payment system for processing reservations securely.
- Seller dashboard for tour package management.
- Database and API services for storing and retrieving data.

Each subsystem relies on the other to operate effectively, meaning a malfunction in one could disrupt the entire platform.

7.2 Complex Engineering Activities (CEA)

TABLE V. A SAMPLE COMPLEX ENGINEERING PROBLEM ACTIVITIES TABLE

Attributes		**Addressing the complex engineering activities (A) in the project**
A1	Range of resources	This project involves human resource, money, modern tools (simulation software/mobile APP), hardware components, etc.
A2	Level of interactions	Involves interactions between different stakeholders including group members to design the device, installing places, Ministry of Environment to collect data, etc.
A3	Innovation	Employs innovative skills of engineering by introducing technology in a different manner in the environment and IoT sector
A4	Consequences to society / Environment	Impact in our environment since it helps to monitors the air quality data and measure AQI
A5	Familiarity	Needs to be familiar with the various sensors, microcontrollers, wireless communication system, circuit designing tools, mobile apps. UN SDG #04: Quality education; UN SDG #10: Reduce inequality

A1 – Range of Resources:
The project involved a variety of resources, including:

- **Human resources**: a three-member team with specialized roles (frontend, backend, UI/UX).
- **Technological resources**: development frameworks, APIs, database services, and deployment platforms.
- **Financial resources**: costs for domain registration, hosting, API subscriptions, and marketing.

A5 – Familiarity:
The team needed to be familiar with:

- Frontend frameworks (React.js, Tailwind CSS).
- Backend frameworks (Node.js, Express.js).
- Cloud storage and database platforms (Cloudinary, MongoDB Atlas).
- Authentication and security systems (Clerk).
  This broad skill set ensured smooth integration of all platform features.

Chapter 8 Conclusions

8.1 Summary

GHURBO: Bangladesh Tour Planning and Travel Agency System was developed to address the lack of centralized, accessible, and intelligent platforms for tourism in Bangladesh. The platform integrates a **multilingual AI chatbot** to assist users in selecting packages, a **real-time booking system** with secure payments, and a **seller dashboard** for tour operators to manage packages efficiently.

Built with **React.js**, **Node.js**, and **MongoDB**, and integrated with cloud services like **Cloudinary** and **Brevo**, GHURBO provides a seamless and responsive user experience. The system promotes tourism growth by connecting travelers with verified operators, enhancing transparency, and improving accessibility for both domestic and international users.

8.2 Limitations

- Currently supports only **English and Bengali** languages.
- Payment gateway options are limited.
- AI chatbot recommendations are primarily budget and destination-based, without full itinerary planning.
- No dedicated mobile application; usage is limited to the web platform.

8.3 Future Improvement

- Expand language support to include additional regional and international languages.
- Integrate more payment gateway options for wider accessibility.
- Enhance the AI chatbot with **advanced itinerary generation** and **multi-destination recommendations**.
- Develop a **native mobile application** for Android and iOS.
- Incorporate user review and rating systems to further enhance transparency.

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