

**CAPSTONE PROJECT REGISTER**

**Class**: **Duration time**: from ..…….../20…. To ..….…./20…..

**(\*) Profession:** <Software Engineer> **Specialty**: <ES> Hộp Văn bản <IS> Hộp Văn bản <JS> Hộp Văn bản

**(\*) Kinds of person make registers:**  Lecturer Hộp Văn bản Students

## 1. Register information for supervisor (if have)

| No. | Fullname | Phone | **E-Mail** | **Title** |
| --- | --- | --- | --- | --- |
| Supervisor 1 | Nguyễn Thị Cẩm Hương | 0909912347 | HuongNTC2@fe.edu.vn | Mrs. |

## 2. Register information for students (if have)

|  | **Full name** | **Student code** | **Phone** | **E-mail** | **Role in Group** |
| --- | --- | --- | --- | --- | --- |
| 1 | Nguyễn Minh Thành | SE170331 | 0988713561 | thanhnmse170331@fpt.edu.vn | Leader |
|  |  |  |  |  |  |
| 2 | Nguyễn Trung Nguyên | SE172267 | 0899759323 | nguyenntse172267@fpt.edu.vn | Member |
| 3 | Nguyễn Ngọc Hòa | SE170538 | 0974164576 | hoannse170538@fpt.edu.vn | Member |
| 4 | Đinh Bá Minh Quân | SE171862 | 0936742446 | quandbmse171862@fpt.edu.vn | Member |

## 3. Register content of Capstone Project

### 3.1. Capstone Project name:

* English: Platform for Green Agricultural Equipment Integrated with AI for Vegetable Sustainable Farming
* Vietnamese: Nền tảng cung cấp thiết bị nông nghiệp xanh tích hợp AI hỗ trợ canh tác rau củ bền vững
* Abbreviation: VerdantTech Solutions

**3.2. Context** The agricultural sector is under increasing pressure to adopt sustainable practices while maintaining productivity and profitability. Traditional farming methods often result in resource waste, environmental degradation, and inefficient equipment usage.

**Current challenges include:**

* Lack of access to eco-friendly agricultural equipment
* Limited knowledge of sustainable farming practices
* Lack of tools to incorporate on-site agricultural indicators into decision-making
* Fragmented information sources for farmers seeking green solutions

**VerdantTech Solutions** is developed to create a comprehensive ecosystem that combines green agricultural equipment commerce with AI-powered sustainable farming guidance. Farmers can access eco-friendly tools, manually input essential indicators such as soil pH and CO₂ footprint, integrate these with real-time weather data via API, and receive more accurate recommendations — all within a unified platform. The project aims to deliver an advanced agricultural technology platform optimized for the sustainability era, applying cutting-edge technologies like AI chatbot consultation, carbon footprint tracking based on user input, and community-driven knowledge sharing.

**3.3. Proposed Solutions:**

* Develop an e-commerce platform specializing in green agricultural equipment and sustainable farming tools
* Integrate AI chatbot for crop cultivation consultation and sustainable farming guidance
* Allow manual input of soil pH and CO₂ footprint values; combine with weather API data for tailored AI recommendations
* Provide plant disease recognition through image analysis with organic treatment recommendations
* Build a farmer community platform for knowledge sharing and best practices exchange
* Offer weather forecasting and seasonal planning assistance
* Implement an admin-managed blog where users can comment, like, or dislike posts, and prioritize articles based on engagement metrics
* **Plant Disease Recognition:** TensorFlow/PyTorch-based computer vision models for accurate plant disease identification
* **Chatbot Intelligence:** OpenAI GPT integration with custom agricultural knowledge base for farming consultation
* **Carbon Footprint Analytics:** Algorithms that combine manual input and weather data for accurate environmental impact calculation
* **Weather API Integration:** Real-time weather data from multiple providers for accurate forecasting
* **Progressive Web App:** Minimize mobile app resource consumption while maintaining functionality

**3.4. Functional Requirements:**

**Customer (Mobile/Web App):**

* Register/login with farm profile setup
* Browse green equipment catalogs with sustainability certifications
* Access AI chatbot for farming consultation and technical support
* Manually input soil pH and CO₂ footprint values
* Participate in community forums and share knowledge
* Receive weather alerts and seasonal farming recommendations
* View and interact with blog posts (comment, like, dislike)

**Shop/Seller (Web App):**

* Register and verify vendor profile with sustainability credentials
* Manage product catalog with green certifications and energy efficiency ratings
* Upload equipment specifications, user manuals, and maintenance guides
* Monitor sales analytics and customer feedback
* Participate in sustainability education content creation
* Offer technical support and consultation services

**System Admin (IT Admin - Web Portal):**

* Manage system-wide accounts and user permissions
* Monitor server performance, API uptime, and data integrity
* Ensure AI model accuracy and chatbot response quality
* Implement security policies and data protection measures
* Manage blog content and moderate user interactions

**3.7. Non-functional Requirements:**

**Performance Requirements:**

* AI chatbot response time must be under 2 seconds for optimal user experience
* Plant disease recognition accuracy must exceed 90% for common crop diseases
* Carbon footprint calculations must be processed with minimal latency after user input
* Weather data synchronization must occur every 15 minutes for accuracy

**Usability Requirements:**

* User interface must be intuitive for farmers with varying technical literacy levels
* Mobile app must function offline for basic features in areas with poor connectivity
* Multi-language support (Vietnamese, English) with agricultural terminology
* Voice input/output capability for hands-free operation in field conditions

**Security and Compliance:**

* Farm data and personal information must be encrypted and comply with data protection regulations
* Payment processing must follow PCI-DSS standards for secure transactions
* AI recommendations must include disclaimers and encourage professional consultation when needed
* Environmental impact calculations must be transparent and auditable

**Reliability and Monitoring:**

* System uptime must exceed 99.5% to ensure farmers have consistent access
* Real-time monitoring dashboards for system health and AI model performance
* Automated alerts for critical weather conditions
* Data backup and recovery procedures to protect farmer information and historical data

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### Technologies:

### Backend: C# with .NET framework, fully containerized with Docker, deployed on Render (PaaS).

### Database: Azure Database for MySQL (managed service) for transactional data storage, with automated daily backups and secure access control via Azure IAM.

### Frontend: React.js (Web) hosted on Vercel with global CDN, HTTPS, and auto-deployment; React Native (Mobile) built via EAS (Expo) and published to Google Play Store / Apple App Store.

### AI/Automation Services: AI chatbot and workflow automation integrated or customized using n8n or Botpress, connected to an agricultural knowledge base; plant disease recognition via third-party Computer Vision APIs, containerized with Docker.

### Weather Services: OpenWeatherMap API, AccuWeather API.

### Cloud Infrastructure: Hybrid setup with Backend on Render and Database on Azure; optional extension to AWS/GCP for green computing practices..

### Real-time Communication: SignalR (with Hubs and Groups) for live comments, like/dislike interactions, and notifications.

### Payment Integration: PayOS, Stripe, MoMo for equipment purchases..

### Notification Service: Firebase Cloud Messaging (FCM).

### Deployment & DevOps:

### All services (Backend API, AI/Automation, and optionally Web frontend) are containerized with Docker.

### CI/CD pipelines: GitHub/GitLab → build Docker images → deploy to Render (Backend) and Vercel (Frontend).

### Azure Database for MySQL with automated backup and monitoring.

### Environment variables and API keys securely managed via Render, Azure, and Vercel platform settings.

### Staging and Production environments separated for safe rollouts.

### Monitoring via Render dashboard (Backend), Azure Monitor (Database), and Vercel Analytics (Frontend)

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### Products:

### Web-based Admin Dashboard for system management and analytics.

### Web Portal for equipment vendors and agricultural experts.

### Mobile Application for farmers with offline capabilities.

### AI Chatbot Service with sustainable farming expertise (powered by n8n or Botpress).

### API Gateway for third-party integration.

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### Proposed Tasks:

### Task Package 1: Develop Web and Mobile Interfaces for Farmer Module. Task Package 2: Develop Web Portal for Equipment Vendor Module. Task Package 3: Develop Backoffice Portal for Agricultural Expert and Content Manager. Task Package 4: Develop Admin IT Portal for System Administration. Task Package 5: Integrate AI Chatbot using n8n or Botpress with an agricultural knowledge base, and implement plant disease recognition through third-party Computer Vision APIs. Task Package 6: Integrate Environmental Monitoring Engine (manual CO₂ footprint & soil pH input combined with weather API, soil moisture tracking).

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| **Supervisor (If have)**  *(Sign and full name)* | HCM, date …… ………. /20 …  **On behalf of Registers**  *(Sign and full name)* |
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