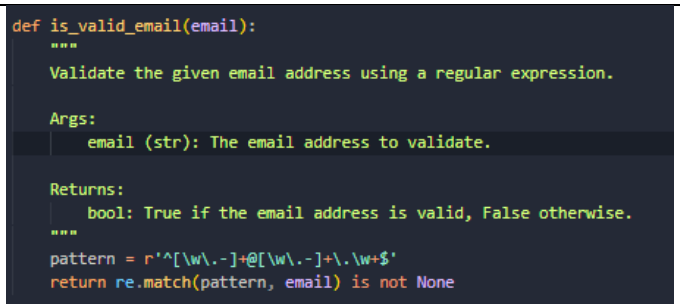
Meeting Functional Requirements of the Solution

Criteria	Met
Account Registration & Login	See flaskr\app.py Registration and Login Route
User Roles & Permissions	See flaskr\app.py Admin Dashboard Route and Dashboard Route
Educational Content	See flaskr\templates\infoPages\
Energy Tracker	flaskr\templates\tracker.html and tracker flask route
Schedule Consultations	See flaskr\templates\personConsultation.html, flaskr\templates\solarConsultation.html, and correlating flask routes
Manage Bookings	See flaskr\app.py Admin Dashboard Route and Dashboard Route
Admin & Technician Features	See flaskr\app.py Admin Dashboard
Installation Scheduling	See flaskr\app.py installation Route, And flaskr\templates\installation.html
Carbon Footprint Calculator	See flaskr\app.py cfc Route, And flaskr\templates\cfpCalculater.html, flaskr\templates\cfp_calculator_submit.html
Accessibility Features	See flaskr\static\js\script.js

Functionality

Criteria	Met
Flexible data handling	One of the Simplest show cases of Flexible Data handling is flaskr/app.py, particularly by generating a secure example password when a user navigates to the registration page using a GET request. How ever this concept is a backbone of the program and is used more advanced in other routes
User account management	User Account Management has been implemented fully with the use of flask Sessons to securely log in users, I have also developed functionality for role-based access, Seen in flaskr\auth.py and flaskr\app.py
Neatly organised code	The Best Example Of Neatly Organised Code is in flaskr\auth.py and flaskr\validation.py Where Functions have been clearly laid out with comments and docstrings

	
Comprehensive APIs	flaskr\consultation.py • Geoapify Geocoding API: (https://api.geoapify.com/v1/geocode/search) used in the address_coordinates function. • Geoapify Place Details API: (https://api.geoapify.com/v2/place-details) used in the get_building_geometry function. flaskr\tracker.py • Google Gemini API: Used in the gemini_format function to process and structure the extracted text data. The genai.Client is initialized and client.models.generate_content is called. • OCR.space API: Used in the ocr_process_file function to extract text from image files. A POST request is made to https://api.ocr.space/parse/image.
Track data	The tracker_upload_file route in app.py demonstrates flexible data handling when processing uploaded energy bills. It uses OCR and Gemini AI to extract structured data from various bill formats, accommodating different layouts and information.
Interconnected modules	The best example of Interconnected modules is in flaskr\consultation.py where multiple modules call other modules, an example of this is solar_potential where it calls get_building_geometry, calculate_area_shapely and calculate_orientation
Optimised algorithms	Calculate_orientation is an example of optimised algorithms seen in flaskr\consultation.py, the function is Clear and concise, Efficient calculations, Direct compass bracket assignment and Error handling to be as quick as possible
Normalised data	The best showcase of normalised data is in flaskr\db.py where get_user_energy_data retrieves energy bill data from the database, processes it, and structures it into a normalized format suitable for generating charts and displaying information.

Code Organisation

Criteria	Met
Clear indentation and structure	Seen All Throughout the codebase
Organised into functions/classes	Seen All Throughout the codebase
Documented with comments	Seen All Throughout the codebase
Efficient use of variables/constants	Seen All Throughout the codebase

OOP design features and Object-oriented programming principles	flaskr\templates\installation.html uses JavaScript to implement a custom dropdown. The logic for handling the dropdown is encapsulated within a JavaScript class.
Recursive algorithms with stopping conditions	Not Needed
Global variables minimised	Only Global Variables used are required for library to function correctly, and do not hold risks of the program security such as the logger setup, what needs to be global to allow logging in all functions
Avoid nested if clauses	No Nested if clauses are used
Named meaningfully	Seen All Throughout the codebase
Independent logic pieces	Seen All Throughout the codebase
Zero unnecessary repeated code	Seen All Throughout the codebase
Appropriate interrelation of parts	Seen All Throughout the codebase, Such as UI and Backend Integration, Component Interaction within UI, Conditional Logic, Validation Layers and Data Flow
Top-level consistency	Seen All Throughout the codebase, Via; Shared Base Template, Centralized CSS, Shared JavaScript, Consistent User Feedback, Standardized Backend Patterns
Interfacing front-end and back-enc efficiently	Seen All Throughout the codebase
Neat and clear Organisation	Seen All Throughout the codebase

User Experience

Criteria	Met
User-friendly interface	Seen All Throughout the codebase, Such as assesbility mode, Consistent User Feedback with flask flash, example passwords, Screen Reader Support, Cross Browser Support, Mobile Support
Excellent error handling and messages	Seen all Throughout the codebase, Using Python Logger and Flask Flash and flask error handlers, to catch and explain every error, And Try and Else Statements in almost every function catching the errors to display This can been seen specifically in the installation routes where specific errors like value error are caught also see add_installation_request in flaskr/db.py
Personalised feedback	Flask Flash is used to give feedback to the users, The best example of this is in the register route where feedback is given to the user, with specific information of what went wrong
Ease of navigation and input	Navigation Bar: A main navigation bar is set up in base.html and appears on every page to help users move between sections easily.

	Content Cycling on Info Pages: Pages like greenEnergy.html use JavaScript to change the content shown when users click an arrow icon. The content comes from a list of sections stored in a JavaScript array. Standard Forms: There are basic forms for login, registration, and consultations. These use standard HTML <input> elements (e.g., for text, email, passwords, phone numbers, dates, and times). The look is styled with style.css to be clean, with clear borders, helpful placeholders, and visual effects when fields are selected. Address Autocomplete: On the Solar Consultation page, users can type their postcode, and JavaScript fetches address suggestions using the GetAddress.io API. These suggestions are shown in real time, and selecting one fills out the form automatically. A debounce function is used to reduce the number of API calls. Conditional Form Fields: On the Installation page, some form fields only appear depending on what product the user selects (e.g., solar panels or EV chargers). This is controlled by JavaScript. File Upload: The Energy Tracker page includes a file upload feature. The standard file input is hidden, and a styled button is used instead to make it look nicer. When a file is selected, JavaScript shows the file name to the user.
Robust accessibility features	Accessibility Features have primarly been implemented in the toggleAccessibilityMode function within script.js, Where by clicking the toggle button, on the nav bar. The page will automatically be loaded into the accessibility mode, automatically on every page till its toggled off. When enabled, the accessibility mode: Adds an accessibility-mode class to the <body>. Disables existing external stylesheets and inline <style> blocks. Saves and removes most inline style attributes, preserving some for elements like charts. Injects a new <style> block (#accessibility-styles) with high-contrast settings, increased font size, simplified layout rules, and uses the 'OpenDyslexic' font.

	Hides images (<img>) and displays their alt text content within a styled (.alt-text). Adds descriptive text (.chart-description) after <canvas> elements identified as charts. Hides certain complex visual elements like .chart-container and .progress-container. Announces the mode change ("Accessibility mode enabled/disabled") to screen readers using a temporary ARIA live region.
Effective validation and sanitisation	Seen All Throughout the codebase, A good example is in flaskr\tracker.py what hold most of the validation for input fields, Done Quickly with regex patterns (a industry standard) A Good example of Sanitisation is SQL Injection Prevention, done in db.py on every function what use parameterized queries
Consistent branding and aesthetics	Using A Base.html file and a external style sheet,
Efficient data visualisation	Base Template Inheritance: Most pages extend base.html, which provides a consistent header, navigation structure, and includes the main stylesheet, Central Stylesheet: The file style.css defines common styles, Reusable CSS Classes: Utility classes like .nixie-font, .hubballi-font, and color classes are applied across different templates, Consistent Component Styling, CSS Variables: Some templates, like personConsultation.html, use CSS variables (:root) to define and reuse specific color schemes within that section.

Legal and Regulatory Guidelines

Criteria	Met
Legal compliance (e.g. GDPR)	Cookie Consent pop-up, Policy/Terms of Service, Explicit Consent, And Security measures like Password hashing can all be found
Ethical considerations	Data Privacy and Security, All Data Stored is disclosed to the user and private information like passwords are hashed As well some Extra considerations have been taken: • An accessibility mode toggle is implemented in script.js and present in base.html. • Accuracy and Reliability • The accuracy of calculations (See test Log) • Transparency and Consent
Accessibility features	See The "Robust accessibility features" Row above
Logically selected fonts and colours	All Colours have been selected to meet WCAGs guidelines, and all fonts are readable with suitable letter spacing, as well as this the accessibility mode removes Colours and using the open dyslexic font

System compatibility	The website is useable on all systems, browsers and devices
Web standards	Website Designed to meet WCAG
Privacy and data policy	Found on the footer of the homepage and dashboard, like most websites, allowing users to quickly find
License and intellectual property	See Asset Log
Terms and conditions	Found on the footer of the homepage and dashboard, like most websites, allowing users to quickly find
Multi-platform support	Yes
Non-discriminatory design	Yes, With Equity in mind
Efficient fallback code	Yes, all errors will be caught in production, using error handlers @app.errorhandler(Exception) means any errors will redirect to home page, not leaving the user on a error screen

Suitability of Test Data

Criteria	Met
Normal data	Done On Every Input Field See example bellow: Example: Test Case 2: User Registration - Normal Data • Input: Email: user@example.com, Password: P@ssw0rd1234, Password2: P@ssw0rd1234 • Result: User registered successfully (Status: Pass). This tests the system with standard, valid inputs.
Erroneous data	Done On Every Input Field See example bellow: Example: Test Case 2: User Registration - Erroneous Data • Input: Email: user@example.com, Password: Password, Password2: Password2 • Result: Initially failed to show a user-facing error (Status: Fail), demonstrating testing with invalid data (passwords don't match) leading to a required fix (Configure Flask Flash).
Extreme data	Done On Every Input Field See example bellow: Example: Test Case 2: User Registration - Boundary Data • Input: Email: user@example.com, Password: P@ssw0rd123, Password2: P@ssw0rd123 • Result: User registered successfully (Status: Pass). This tests the system with data at the edge of defined requirements (e.g., minimum password length).

Use of Testing to Inform Iterative Development

Criteria	Met
Testing of inputs	Extensive testing (approx. 67 tests) focused on user interactions with input fields, buttons, dropdowns, and form submissions, ensuring the UI behaved as expected and captured data correctly.
Testing of calculations	Specific tests (7 recorded) were performed to verify the accuracy of backend calculations, such as carbon footprint totals and solar potential estimations, based on defined inputs.
Testing of validation	Numerous tests (approx. 28) specifically checked both client-side and server-side validation rules, including required fields, data formats (email, phone, date, time), and logical constraints (e.g., booking times, past dates).
Testing of processes	End-to-end user workflows like registration, login, submitting calculations, booking consultations, and retrieving data were tested (approx. 13 tests) to ensure the steps flowed correctly and integrated properly.
Evidence of iteration	The log provides significant evidence (33 instances) of a test-fail-fix-retest cycle. Failures were documented, specific fixes were identified and implemented (e.g., adding routes, fixing database queries, adjusting validation, correcting UI elements, improving OCR/AI), and subsequent tests often confirmed the resolution, demonstrating how testing directly informed improvements. As well as this a grand total of 119 tests were done.

Quality of Iterative Development Process

Criteria	Met
Records of changes	See Change Log and the Task 2 Versions
Rationale for changes	See Change Log
Versioning method used	Git with a local repository, See the hidden git folder, and the CHANGELOG.md