**Embedded Systems Project Idea: Smart Thermostat with RTOS**

This project fulfils all the requirements specified for the embedded systems module final project.

**Application Idea:**

Develop a smart thermostat using an STM32F7G Discovery board. This thermostat will allow users to control room temperature remotely through a Graphical LCD (GLCD) touchscreen interface or a mobile application (optional - for extension).

**Technical Specifications:**

* **Microcontroller:** STM32F7G Discovery Board
* **Real-Time Operating System (RTOS):** KeilRTX
* **User Interface:** GLCD touchscreen
* **Sensors:** Temperature sensor (DHT11)

**Functionalities:**

* **Temperature Measurement:** The thermostat will continuously measure the ambient temperature using the temperature sensor.
* **Temperature Setting:** Users can set the desired temperature through the GLCD touchscreen interface.
* **Temperature Control:** The system will control a heating/cooling element (simulated using LEDs in this project) to maintain the desired temperature.
* **Real-Time Display:** The GLCD will display the current temperature, target temperature, and heating/cooling status.

**Benefits:**

* Improved energy efficiency by optimizing heating/cooling cycles.
* Remote control and monitoring of room temperature.
* User-friendly interface for easy temperature control.

**Challenges:**

* Implementing a real-time temperature control system.
* Designing a user-friendly and intuitive GLCD touchscreen interface.
* Integrating the RTOS for efficient task management (e.g., temperature sensing, user interaction, control loop).

**Development Tools:**

* STM32CubeMX for code generation and configuration.
* Keil RTX library for RTOS functionalities.
* Touchscreen driver library for GLCD interaction.
* A C compiler

**Deliverables:**

* Functional smart thermostat application on the STM32F7G Discovery board.
* RTOS-based code with proper task management.
* User interface implemented on the GLCD touchscreen.
* Doxygen documentation for the project code.
* A short video demonstrating the application functionalities.

**Extension:**

* Develop a mobile application to control the thermostat remotely through Bluetooth or Wi-Fi.

**Conclusion:**

This smart thermostat project provides a good opportunity to apply the concepts learned in the embedded systems module. It utilizes an RTOS for efficient task management, integrates a GLCD touchscreen for user interaction, and demonstrates the development process using common tools for embedded systems development.