Building and Managing a Greenhouse

You have been assigned the task of creating a Python program to simulate the operation of a greenhouse. The greenhouse has various components, including plants, environmental sensors, irrigation systems, and a controller. You will need to implement three different classes to model these components and manage the greenhouse efficiently.

Here are the specific requirements for the different classes:

1. **Plant Class**:
  Create a Python class called `Plant` with the following attributes:
- **name** (string): The name of the plant.
- **species** (string): The species of the plant.
- **age** (integer): The age of the plant in days.
- **water_level** (float): The current water level of the plant's soil.
- **light_exposure** (float): The current light exposure of the plant in Lux. Should be a random number between 0 to 1 that changes daily.
- **water_requirement** (float): The daily water requirement of the plant in milliliters.
- **light_requirement** (float): The light requirement of the plant in milliliters (a number between 0 to 1)
- **Height** (float): The height of the plant in cms.

  The `Plant` class should also have methods for:
- **water(amount)**: To water the plant by a specified amount (in milliliters).
- **provide_light(intensity):** To provide light to the plant at a specified intensity (in Lux).
- **grow():** To simulate the plant's growth for a single day. The formula for the <u>daily</u> growth is given by -
    - random_number*(min(water_level - water_requirement,1)) where random_number is a random number between 0 to 1
    - if the light_exposure < light_requirement the daily plant's growth = 0
    - Note that after applying the grow() method the water_level should be set to zero.

2. **Irrigation System Class**:
  Create a Python class called `IrrigationSystem` to manage the greenhouse's irrigation system. The class should have the following attributes:
    - **water_level** (float): The current water level in the greenhouse's water tank (in liters).

  Implement methods for:
    - **add_water(amount):** To add water to the tank by a specified amount (in liters).

- **irrigate_plants(plant_list):** To irrigate all plants in a given list by distributing the available water evenly among them. (note that when we irrigate the plants the water is taken out of the tank)

3. **Greenhouse Controller Class**:

   Create a Python class called `GreenhouseController` that serves as the central controller for the greenhouse. The class should have the following attributes:

- **plants** (list): A list to store instances of `Plant` objects in the greenhouse.
- **irrigation_system** (instance of `IrrigationSystem`): The irrigation system for the greenhouse.

   Implement methods for:
- **add_plant(plant):** To add a new plant to the greenhouse.
- **water_plants():** To trigger the irrigation system to water the plants.
- **run_simulation(days):** To run the greenhouse simulation for a specified number of days, during which the environmental conditions change, and the plants grow.

Testing

   Provide a section at the end of your Python script that demonstrates the functionality of your greenhouse simulation. Create sample plants, sensors, and interactions in the testing section to showcase how the greenhouse controller manages the environment, waters the plants, and tracks plant growth over time.

Documentation and Comments:

   Include appropriate comments and documentation for your code to explain how it works.

For any questions: uziel.guy@gmail.com
Please follow the course's moodle for any updates.

Goodluck!