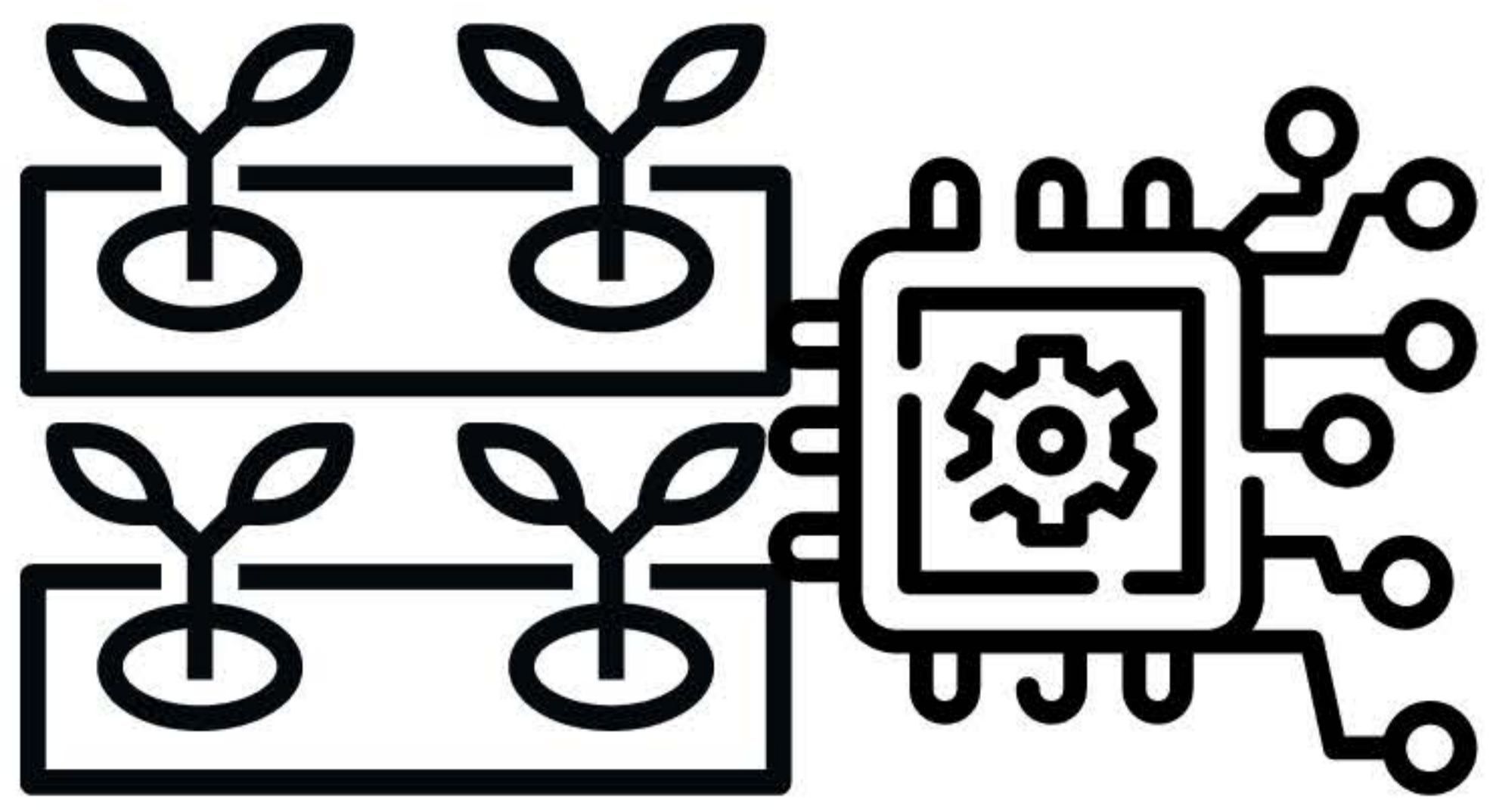


AquaHarvest



How can embedded systems be used to enhance the reliability of various systems?

Suggested Equipment Skill Level

Intermediate User

Equipment Skills

Coding

System Engineer

Career & Skillset Connections

- Analytical
- Detail-oriented
- IT and computer knowledge

Project Guiding Themes

- Engineering design process
- Coding the Raspberry Pi

Suggested Software & Materials

- Raspberry Pi
- Raspberry Pi components

Aligned VDOE CTE Course(s) and Competencies

Information Technology Fundamentals

36-Weeks

Programming

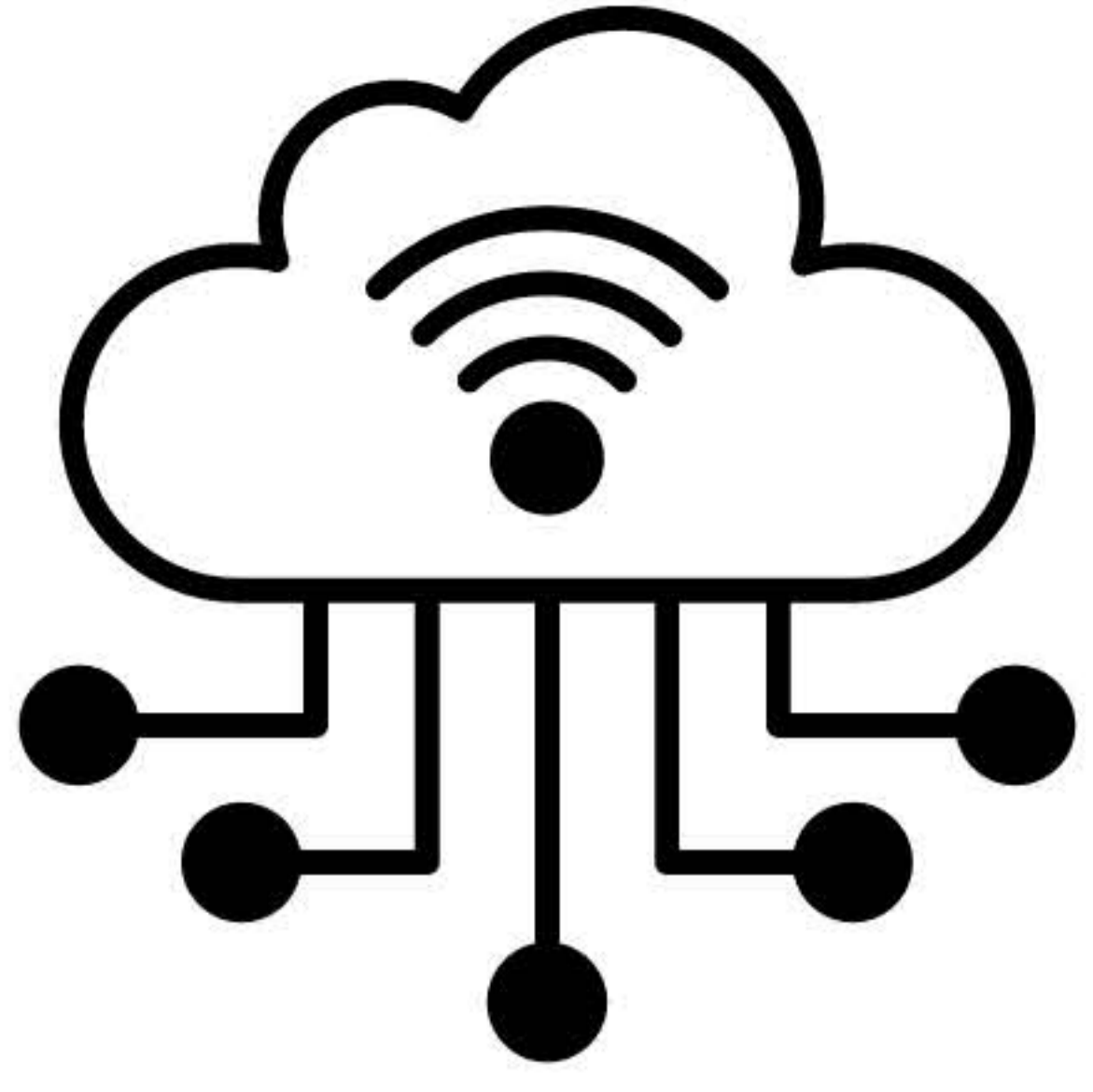
36-Weeks

Technology of Robotic Design

36-Weeks

AquaHarvest

Embedded System Intermediate Skill Level



How can embedded systems be used to enhance the reliability of various systems?

Project Problem & Career Prompt

As a system engineering student, you have constructed an aquaponics system as project for a course. You are also working with a local school system to help their sustainable food initiative. The aquaponics system is going to grow lettuce and some herbs to be harvested by the food services staff and used for lunch preparation throughout the school year. You have constructed the system in a temporary classroom located outside of the main school building. The temperature of the building fluctuates, and this will affect how the plants grow in the system. You need to design and develop a system that will monitor the temperature and then signal an alarm when the temperature is outside of optimal range.

Project Background & Resources

Aquaponics system - how it works, how it is constructed, and what can be grown

<https://education.sunfounder.com/raspberry-pi-lesson-28-build-a-programmable-temperature-sensing-alarm/>

Investigative Questions

- What criteria should trigger the alarm system to alert stakeholders and how can this be determined?
- How frequently should temperature data be analyzed to ensure real-time responsiveness?

Project Criteria

- Demonstration of temperate fluctuations
- Alarm must alert stakeholders
- Final working prototypes must be completed by the project deadline

Project Constraints

- Raspberry Pi equipment must be used to develop the prototype
- Program used to code the RVR+ must be coded by you

Suggested Pacing

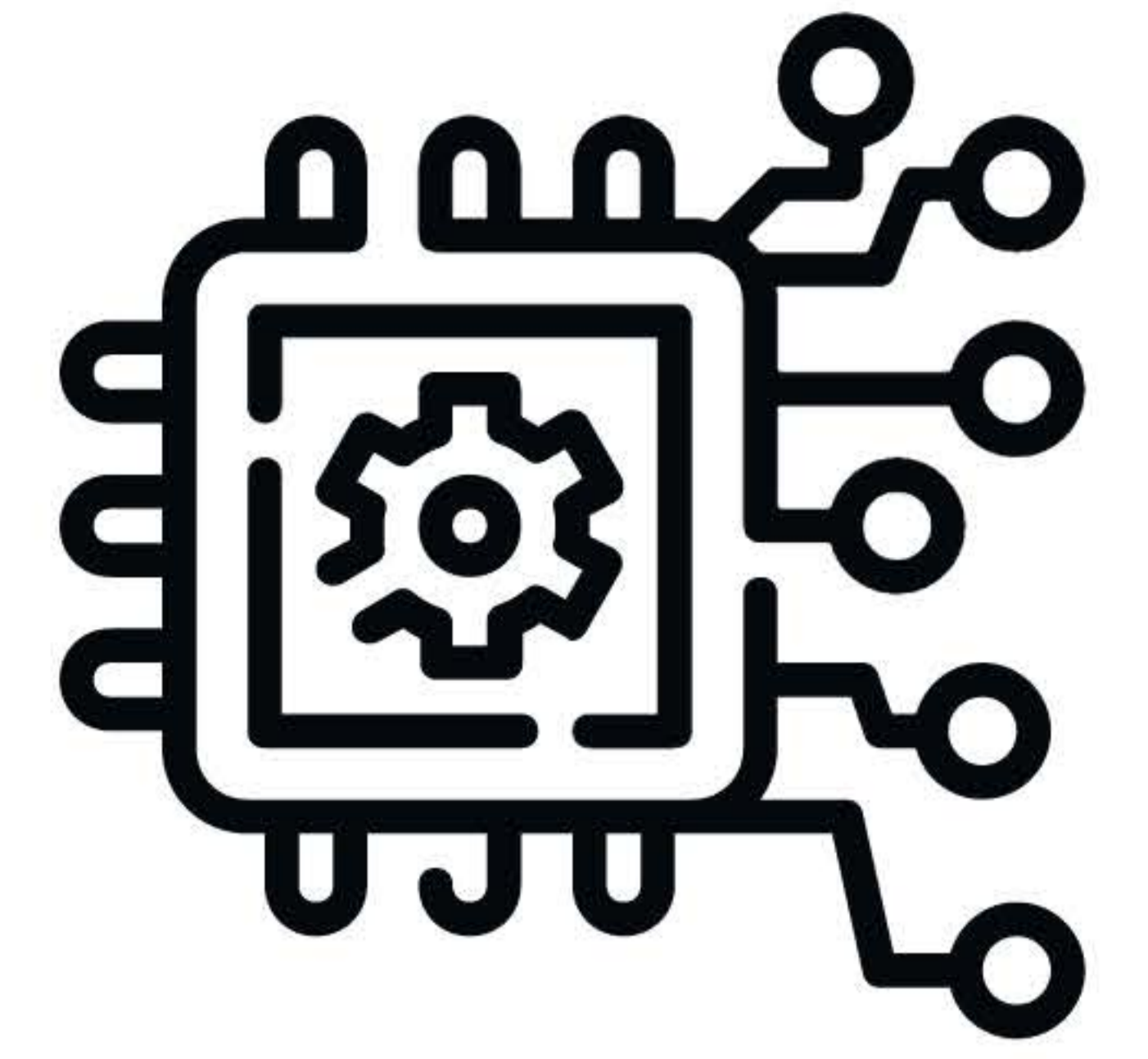
1-2 Days of research and sketching ideas

2-3 Days of coding and design

3-4 Days of testing and adjusting (then retesting)

AquaHarvest Embedded Systems

Career & Skill Set Connections



System Engineer

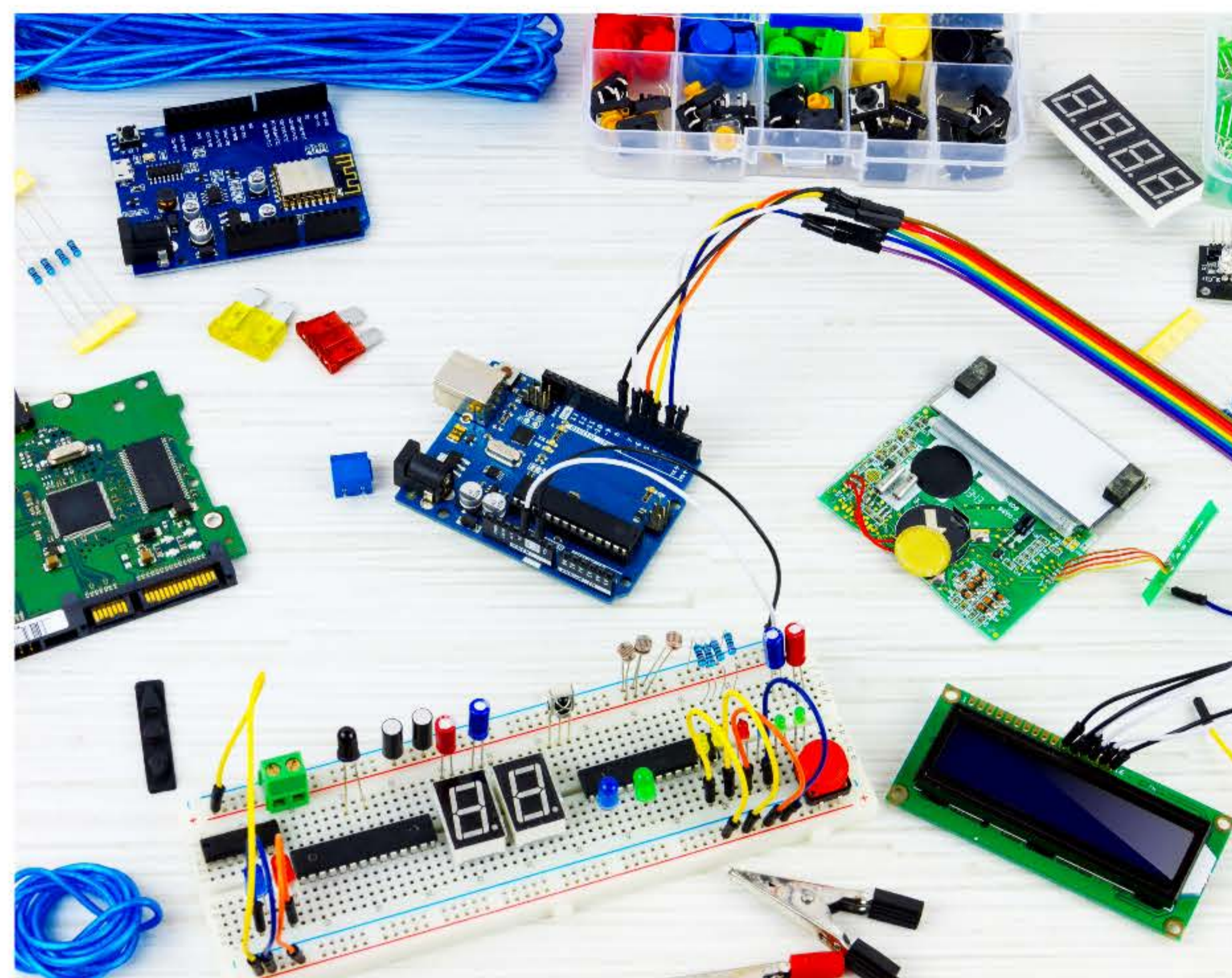
A system engineer designs, integrates, and maintains complex systems and product lifecycles that support complex problem-solving and product development.

Essential Skills

- *Data architecture and programming
- *Organizational
- *Attention to detail
- *Communication

Academic Pathway

High School Diploma
and
Community College/Certification
or
Bachelor's degree



Aligned VDOE CTE Course(s) and Competencies

Workplace Readiness Skills & Work-Based Learning Opportunities & Examine All Aspects of an Industry

Information Technology Fundamentals

Exploring Programming

Explain the purpose and functions of computer programming

Identify the types of programming languages

Design a simple program for a specific application

Execute a simple program

Developing Career Exploration and Employability Skills

Investigate careers, education requirements, and certifications in the IT career pathways

Demonstrate project management skills

Programming

Exploring Programming Concepts

Describe the development of programming languages and applications

Describe the basic concepts of a programming language

Implementing Programming Procedures

Design a program, using algorithm, pseudocode, a flowchart, and/or a decision table

Code the program, using a programming language

Test the program with sample data

Debug the program

Document the program

Implement the program

Technology of Robotic Design

Exploring Robotics and Automation Systems

Investigate careers in robotics, automation, and control systems

Explain the universal systems model

Programming an Automated System

Implement basic programming procedures

Select the most appropriate programming language/platform for application

Program an automated system

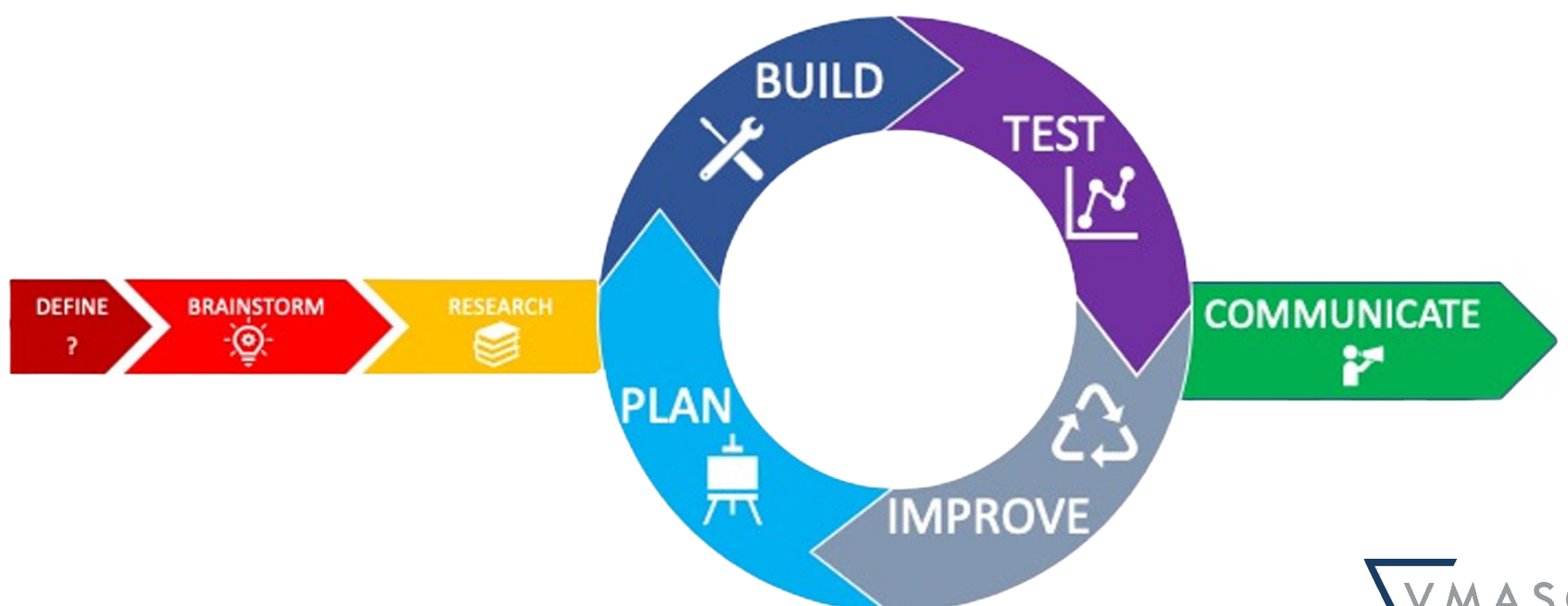
Project Management Plan

Team
Member
Roles

Team
Goals &
Timelines

Team
Member
Tasking

Sketches & Design Planning



Notes

Notes