MICROCONTROLLERS AND SENSORS FOR INNOVATION

Recommended for 14 - 18 year olds

30 hour practical project

Learning about microcontroller programming and sensors, then applying it to the world around us

#electronics

#programming

#innovation

#bettersociety

TEACHER GUIDE

How to run a Silver CREST Project using the Grove Beginner Kit for Arduino

Main activities your students will need to complete to achieve a CREST Silver Award using the Grove Beginner Kit for Arduino (approximately 30 hours of project work)

- **Learn how to use the Arduino kit**
- **Develop and lead a project based on the Arduino kit**
- **Consider the broader impact of their project and demonstrate an innovative approach**
- **Write a project report or portfolio of evidence**
- **Reflect on their work using the student**

Sign Up with CREST

The first step is to sign up with CREST. Create a new Silver Award project with the name(s) of the student(s) and the title of the project.

CREST Criteria

Before starting the project, read through the Student Guide and Student Profile Form to help you understand what is required and what the assessor will be looking for.

Grove Beginner Kit for Arduino

The Grove Beginner Kit for Arduino is one of the best kits for beginners to be able to build any Arduino project. Some are available for free from UKESF for state schools in certain area. Use the link below to find out more.

Introduction to Project

This project has two halves. Initially students will be learning about their Arduino kits and what it can do and how to program them. The second half is their own ideas about how to use the features of the Arduino to create their project.

Introduction to Arduino Kit

The initial session will focus on getting to know the Arduino kit. It is recommended you use the **UKESF Arduino kit guide**

Running the Project

Encourage students to use the guides and to document all their work as they go along. A project diary will help with the final report. Help students to consider health and safety risks.

Support

Find a mentor for your students by contacting UKESF. Email: electronics.everywhere@ukesf.org

Reflection

The Student Profile form has a 'Personal Reflections' section which will need to be completed, reflecting on all the skills acquired during the project. For group projects students can all submit the same joint report, but they will need to complete an individual Student Profile form.

Entering Project for CREST Silver Award

Upload the completed report and other evidence such as pictures and diagrams. Complete delivery and payment details

CREST Sign in To register and set up the Silver Award Project.
Student Profile Form For students to download and fill in.
Student Guide To help the students follow the CREST criteria for their project.
UKESF Arduino Kit Guide To get you started on the kit and to find out if you are eligible for free kits
Rapid Online Kits To buy the Grove Kits.

STUDENT GUIDE

Microcontrollers and Sensors for Innovation
Project Brief

During this project you will be exploring microcontrollers and hardware sensors, learning how to program them and then go onto applying this to your project with your own application.

Arduino

Arduino is an open-source platform used for building electronics projects. Arduino consists of both microcontroller (a physical programmable circuit board) and a piece of software that runs on your computer, used to write, and upload computer code to the microcontroller.

Grove Beginner Kit for Arduino

The first part of this project will involve learning about your Grove Arduino kit. The best way is to follow the link in the resources list below to the UKESF introduction to the kit.

Investigate the different roles the sensors in the kit perform and how to program them.

Research

After finding out how all the parts of your kit work, do some more research into possible projects with Arduinos and sensors. There are a couple of suggestions in the resources below, but you can also search for your own.
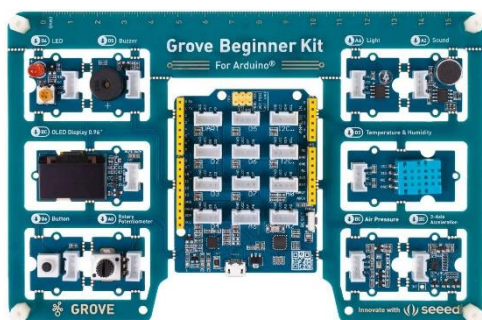
Your Project idea

Now you need to consider your own project idea. You need to come up with an idea that you can prototype on your Arduino kit. Prototype means making sure your idea works by trying it out on the kit.

When thinking of ideas, you can consider projects that promote social good by addressing an environmental, health, education, or climate change issue. You could find a solution for an problem that impacts on your life or somebody close to you.

Here are a few possible ideas that you can use or come up with your own:

- a smart irrigation system for water conservation
- a solar tracker for renewable energy
- a fitness monitor
- an air quality monitor for environmental awareness
- a memory or reflex game to help promote healthy brains
- a flood alarm
- a gesture operated bin

Student Profile Form For students to download and fill in.
Student Guide To help the students follow the CREST criteria for their project.
UKESF Arduino kit guide To get you started on the Arduino.
SEEED Studio Arduino Project ideas.
Electronics For You Arduino Project ideas.

STUDENT GUIDE

Microcontrollers and Sensors for Innovation
Top Tips

Student Guide

Make sure you read the Student Guide, particularly the assessment criteria, so you know what the assessors will be looking for in your project. You will also need to fill in a Student Profile Form.

Research

Do your research! In this project that includes the initial learning about the Grove Arduino kit.

You can use the internet, magazines, libraries, news articles, blogs and people as part of your research. Ask your teacher to help find a professional mentor if you feel that would help.

But research is not just at the beginning. As you are designing and testing your project you can do further research to improve and generate more ideas.

Plan

Write and/or draw a plan showing how you will approach your project. List tasks to be completed, resources you will need and estimate how long your tasks will take. Ask your teacher for feedback on your plan.

Risks

Identify any health and safety risks. Show the risk assessment to your teacher and include it in your final project report.

Practical Work

Make sure you test all your ideas. Try to think of different ways to test your idea. Make sure you record all tests, those that went well as well as those that didn't! Photos can really help capture the test and help you remember exactly what has been tested.

Concluding your project

What have you found out from your project?
What problems have you overcome?
What is the impact of your project on other people?
How could this project be developed from this prototype stage to something that could be used?

Choose the best way to communicate your project

Producing a written technical report is a popular choice when presenting a project. But you can use a digital presentation or a blog or a poster display.

Whichever method you choose make sure to include all the stages of you project, from initially learning about the Arduinos, to planning and creating your design and testing through to the conclusion.

REMEMBER:

Creating a project using this resource does not guarantee a CREST award. Projects must still meet the CREST criteria and will be assessed by CREST external assessors – their judgement is final.

Full list of resources - web links

CREST
https://www.crestawards.org/sign-in

Student Profile Form
https://secondarylibrary.crestawards.org/crest-student-profile-form/62632654

Student Guide
https://secondarylibrary.crestawards.org/student-guide-silver/62444085

UKESF Arduino Kit Guide
https://www.ukesf.org/what-we-do/insight-into-electronics/

Rapid Online Grove Kits
https://www.rapidonline.com/seeed-110061162-grove-beginner-kit-for-arduino-with-10-sensors-and-12-projects-75-0442

SEEED Studio – Guides to the kit and project idea
https://www.seeedstudio.com/blog/2021/09/17/arduino-fun-projects-roundup-with-grove-kits-tutorials-reviews-and-community-feedback/

Electronics For You – Project ideas
https://www.electronicsforu.com/arduino-projects-ideas

Email for support from a STEM mentor:
electronics.everywhere@ukesf.org