Project Charter:

Project Title: EcoCrank - Exercise Hand Crank Power Bank

Project Start Date	11/16/24
Project End Date	01/18/25
Project Manager	Denille Rylie C. Galas
Team Members	Josiah R. Bucas, Jade D. Penales, Anthony Lee Aleister Ortiz

Project Overview

The **Hand-Crank Power Bank** project aims to create a functional hand crank that generates and stores electrical energy as users perform hand exercises. The mechanical energy from squeezing the gripper will be converted into electrical energy, stored in a rechargeable battery, and used to power small electronic devices through a built-in USB port. The project will integrate energy generation with an efficient power management system using a microcontroller (such as Arduino) to control energy conversion, storage, and output.

Project Objectives

1. To create and implement a hand crank device that converts mechanical energy into electrical energy that can charge small devices via USB port. Along with the integration of a rechargeable battery to store said electrical energy for portable uses.

2. To harness mechanical energy as a renewable and sustainable power source for charging small electronic devices via a USB port.

3. To ensure the prototype is efficient in maximizing energy conversion and storage capabilities, functional in providing energy for charging small devices, safe for the user and the devices, portable for ease of transportation and user friendly.

Project Scope

In-Scope:

Development of the Energy Conversion Mechanism:

The project will mainly focus on designing and implementing a hand-crank mechanism integrated with a dynamo generator to convert mechanical energy into electrical energy, serving as the primary power source.

Compact and Portable Design:

The device will be engineered to be lightweight, ergonomic, and portable, allowing users to recharge small electronic devices conveniently in any location using mechanical energy.

Prototyping and Functionality Testing:

A fully functional prototype will be created, demonstrating efficient energy conversion and storage capabilities. This includes rigorous testing to ensure reliability, durability, and user-friendliness under various conditions.

Energy Storage System:

The prototype will include a rechargeable battery to store the generated energy, allowing users to charge their devices even when the hand crank is not actively in use.

Out-of-Scope:

High-Powered Device Support:

The device is not designed to charge high-powered electronics such as laptops, tablets, or power tools. It will only support low-power devices like smartphones, USB light bulbs, MP3 players, and similar gadgets.

Advanced Charging Features:

Features like fast charging, multiple output types (e.g., USB-C and USB-A), or wireless charging technologies will not be incorporated into the prototype.

Integration of Alternative Energy Sources:

The device will not include supplementary energy generation methods such as solar panels or wind generators, focusing exclusively on mechanical energy conversion.

Comprehensive Compatibility:

Ensuring universal compatibility with all electronic devices is out of scope. The prototype will prioritize compatibility with common low-power devices.

Roles and Responsibilities:

Role	Responsibility
Project Manager (Denille Galas)	Oversee project timeline, resources, and team coordination.
Hardware Engineer (Jade Penales)	Design and build the generator, battery storage, and USB charging circuits.
Code Developer (Aleister Ortiz)	Develops the code for power management, including battery monitoring and control.
System Analyst (Josiah Bucas)	Tests the prototype, ensure functionality, and troubleshoot any issues.

Milestones and Deliverables:

Milestone	Deliverable	Completion Date
Project Charter Document	This Includes the project scope, objectives, roles and responsibilities, milestones, deliverables, and timelines.	11/09/24
System Architecture	A clear system architecture diagram that shows the different components of the project and any hardware/software integration required.	12/03/24
Code Documentation	Code should be thoroughly documented. Each function or module must be explained, and should be backed up via Github.	12/16/24
Working Prototype	A fully functional prototype that demonstrates the system in action, with clear contributions toward sustainability objectives.	1/18/25

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Timeline

Phase	Start Date	End Date
Design Phase	11/23/24	12/01/24
Development Phase	12/02/24	12/16/24
Testing Phase	12/17/24	01/17/25
Final Delivery	12/21/24	01/25/25

Sustainable Benefits & Societal Impacts

The EcoCrank has its benefits and contribution to sustainable energy. By converting mechanical energy into electrical energy, the device harnesses a renewable, non-polluting power source. This reduces reliance on traditional fossil fuels and the environmental impact associated with their use.

It can also reduce e-waste, by allowing users to generate their own power, the device can help reduce the need for disposable batteries or reliance on mains electricity, contributing to less electronic waste in the environment.

And lastly, it can act as a physical activity or arm exercise, as using the hand-crank device requires physical effort, which can help promote light physical activity. Cranking the device regularly can contribute to improving hand and arm strength, as well as enhancing circulation and joint flexibility.

Working Prototype

The final working prototype will consist of:

- A functional hand crank that generates electrical energy during use.
- A rechargeable battery for storing the generated energy.
- A USB port that can charge small electronic devices (e.g., phones, MP3 players).
- An Arduino-based system that monitors energy generation, controls battery charging, and manages voltage output.

References:

- *DIY - 11000mAh Mobile Power Bank 5V 2.4A / QC | Multiple Mobile Charger | PO…*
- DIY HAND CRANK ELECTRIC GENERATOR | SUPERCAPACITOR POWER BA…
- Modify Broken hand-crank generating flashlight to USB charger. DIY & MOD hand…
- V2 DIY Hand Crank BoostBox - Capacitor Power Can Start a V6 Engine
- 4-IN-1 Hand Crank Generator Flashlight Powerbank for Emergencies
- Voltage Sensor with Arduino Uno