

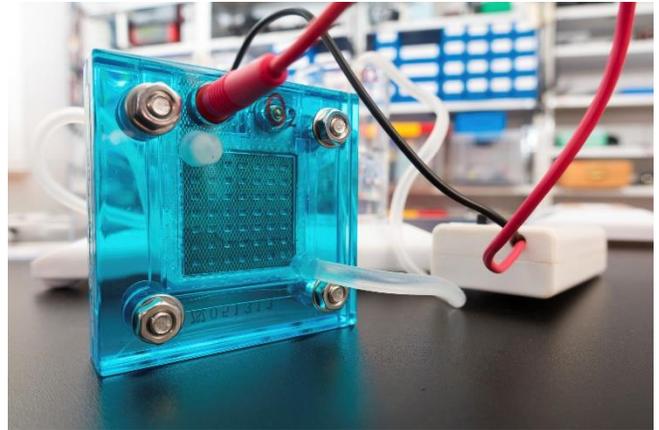
Energy Management Program

Program Introduction

Imagine how the world would look like if we have no electricity. Electric devices become an essential part of our daily life. Electric bulbs, Mobile phones, internet and the computer you are using now to read these words are just a few examples of what electricity presents to our lives. As our life is so dependent on this sort of energy, humans are very concern about generating it and ensuring there is enough amount for the future. Have you heard of wind turbines, photovoltaic cells, fuel cells and tidal turbines? If not, you missed a lot. Those are examples of human's successful trials of generating electricity from natural resources. Now, it's your time to be part of this journey of research and learning and generate your own electricity. This program is designed to expose you to different fields of engineering and sciences from mechanical, electrical and petroleum engineering to physics and chemistry. In addition, the program is dedicated to improving your personal skills. Generally, knowledge, personal development and engineering skills are the main drives behind this program's outline and practices.



As scientific knowledge is the base for inventing, the program is intended to understand the basics from different fields of study. You may be exposed to the laws of thermodynamics, Faraday's law of induction galvanic cells and the conservation of energy. You will explain how energy transform into different types and the main law that control that. Also, you will be exposed to inventions like turbines, generators and fuel cells where you will be able to explain the theory behind it. At the end of the first phase, preparation phase, you will design your own little invention.



In the second phase, you will use your knowledge you acquire to design your electric source of energy. Before that comes the initial energy form. You may get your electric energy from chemical reactions, wind energy, solar energy, or even from garbage. The main rule you are playing is to maximize your gain by choosing the most efficient, cost effective method, and therefore, the engineering design process (EDP) is an essential part of this phase. You make calculations using the laws you have learnt in mechanics, and simulate your product using (MultiSIM) and (LabVIEW). Here comes the most interesting part when you transform your innovation into reality and begin to test your simulation values. Seeing your first prototype is a moment of excitement, joy, and pride. However, all errors come here. As engineering is an iterative process, you are expected to re-design, re-implement your product. Don't worry about complexity. Your instructors are here to help you.

Be prepared for the challenge to begin!

Program Skills structure

The program is mainly concerning about developing skills rather than memorizing and that is the main base for the project-based learning. The journey here involves acquiring knowledge, understanding how nature works as this would be the main target of the program. Then follows teamwork skills. We cannot do significant something alone.

Teamwork is a guarantee for maximum efficiency. You will involve with your team members discussing the design and implementation. As disputes are inevitable at the

beginning, by time, you will acquire the skills to discuss efficiently. Then comes the practical application for which the team is constructed for. You and your team begin to describe resources, find a solution for the problem and make and design. However, in your design, you have to consider cost and efficiency which is part of designing and practical work skills. It's a wonderful experience.



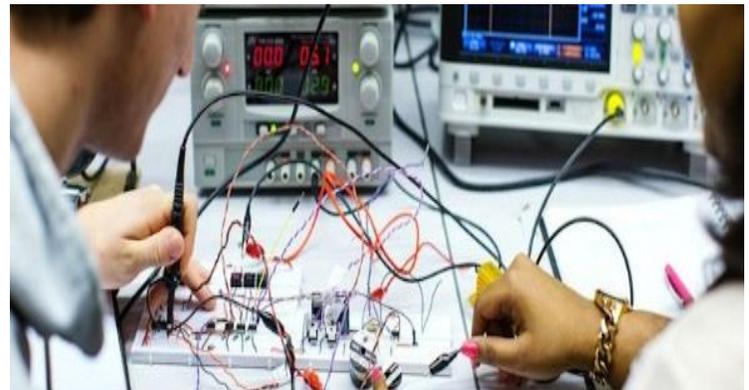
Scientific and knowledge skills

Science and knowledge are guiding our revolution in the twenty-first century. Their existence is of great importance for efficient design. Without knowledge, we are not expected to apply it, which is what engineers do. Here, students will study the scientific topics from their basics and at the same time will enjoy the beauty of it by making fun experiments



Engineering and Hands-on skills

Different form experiments, here, you are using knowledge to make a machine with a specific function that helps humans in somehow. You will work according to the engineering design process where you are considering the problem, find the solution and test your prototype. Nothing is more existing than creating your model from scratch, and watching it works. You will love the moment your voltmeter reads your first voltage.



Personal and Teamwork Skills

For large projects, humans are required to work in groups as a way to increase efficiency and productivity. Acquiring such skills is essential and thus, the program is concerned about improving your teamwork skills. You will be experience opposition from members and hard times, but above all you will learn how to discuss your points and shows your weaknesses and strengths. By time, your communication skills will be developed until you're able to persuade. From this point, it's the way to business and management skills. You're expected to make a business plan for your project in which you market your project.



Program progress phases

Phase 1 – Preparation

In this phase you will be introduced to the principles of thermodynamics, electricity and electrochemistry. You will also be introduced to classical methods of electricity production as well as new alternative environment-friendly approaches. The objective skills set for this phase is:

1.S: Scientific and knowledge content

You will be introduced to thermodynamics where you will study energy changes in systems and how energy can be converted from one form to another. You will also be taken to a journey with Nikola Tesla, Michael Faraday and Thomas Edison where you will be shown how our ancestors used to generate and use electricity. After this journey you will be ready to witness the future and see alternative energy generation methods that aim to reduce the environmental damage done by fossil-fuel-driven energy generation methods.

1.E: Engineering Practices

Case studies for selected designs of motors and generators. Measuring key factors for efficiency and optimization. You will also inspect real life engineering application of the topics studied in the scientific sections that include the wind turbines, solar energy and other energy generation approaches. In this part, students will appreciate the role that science plays in their real life.

1.H: Hands on Activities and checkpoint assignment

Here comes the part where we start playing around and building our own small-scale prototypes. Hands-on activities will run in parallel with the scientific content and the engineering practices so that students can apply what they study. They will have a checkpoint assignment in which they will build a small battery and measure its physical properties.

Phase 2 – Design

In this phase you will be through something exciting, learning whatever it takes to start designing your project. CAD Software, design structure, mechanisms, electronics, microcontrollers, sensors, motors, simulations Apps, etc.

2.S: Scientific and knowledge content

Electricity, magnetism, dynamics, motors, generators and batteries. Students will study design mechanisms and principal components of an efficient design.

2.E: Engineering Practices

CAD (Solid Work), Coding (Arduino), Electronics CAD (MultiSIM), Simulation and Test parameters (LabView).

2.H: Hands on Activities and checkpoint assignment

Complete CAD and Simulation test of the chosen solution/project with all features (Mechanics, Electronics, Control, Sensors, Battery power management, etc.). Specify what exactly your project will achieve and how this can be authentically measured.

Phase 3 – Implementation

In this phase, all your dreams shall come true. It will completely dedicated to building your project from scratch. Enough about theories and formulas or equations, it's time to put all the designs and simulations into a real thing. You will not succeed from your first attempt. But don't worry we got your back.

Together we shall redesign, and modify the project and this is the fun part. Debugging and modification is the last step before you see your work doing what it is supposed to do.

3.E: Engineering Practices

Fab Lab, real time components testing, re-Design and re-Implement and retesting.

3.H: Hands on Activities and checkpoint assignment

Project construction, and testing. This is the part of pride and appreciation. In this part, you will watch your project doing what it is supposed to do. You will witness the effort that you have put into this project turning to success.