SP SCHOOL OF Mechanical & Aeronautical Engineering

SP Singapore Polytechnic

Engineering Challenge 2023

Design Category: Urban Farming

1. Introduction

This year's theme is "urban farming". Coastal cities are especially vulnerable to rising sea levels, which threaten to submerge entire communities and displace millions of people. Many countries are also struggling to feed their populations as crops fail due to changes in weather patterns and more extreme weather events.

As temperatures and weather patterns become increasingly unpredictable, the need for sustainable and efficient methods of food production has become more urgent. Urban farming has emerged as a viable solution, allowing for the cultivation of fresh produce in areas that are often impacted by extreme temperature changes and other weather-related challenges. With rising temperatures and more frequent weather fluctuations, cities like Singapore are particularly vulnerable.

In response to the challenges posed by these unpredictable weather patterns, many cities have started investing in urban farming initiatives, creating green spaces and community gardens that can adapt to a wide range of temperature and weather conditions. These initiatives have not only helped to increase food security but have also brought communities together, fostering a sense of connection and collaboration in the face of climate change.

This year's challenge will require students to envision themselves in a world where global warming has taken over, and intense weather has become the norm. Crops have been thrashed by this and there are no easy sources of crops and food. Students will need to infuse both physics and basic engineering skills to create their designs of urban farms. They will have hands-on experience in using 3D CAD modelling software to easily create and modify their design.

This Urban Farm Design Competition 2023 is organised by the Singapore Polytechnic's School of Mechanical and Aeronautical Engineering.

2. Competition Rules

2.1 This year's theme is "**Urban Farming"**.

2.2 Participants are required to design and build a desktop size Indoor Smart Gardening System.

2.3 The indoor smart gardening system can be either soil-based or hydroponic-based.

2.4 It is **compulsory** for participants to make use of mechanisms and monitoring systems to make their garden system self-sustaining **(sample ideas in Figure 1 & 2 below for reference purpose).**

2.5 Actuation is not compulsory but highly encouraged.

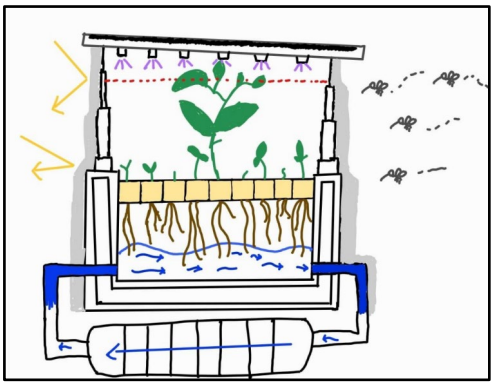

Figure 1: Sample Idea 1

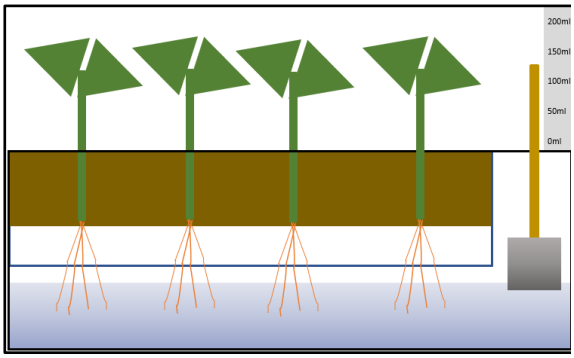

Figure 2: Sample Idea 2

2.6 Prototypes should have sufficient space to grow plants.

2.7 Participants are encouraged to research plants that are suitable to grow in a soil-based or hydroponic environment.

2.8 Participants are allowed to choose the plants that they would like to grow in the Garden System. Seeds, seedlings and growing medium can be purchased in stores such as Fairprice or any online retailer. https://www.fairprice.com.sg/category/gardening-seeds

https://www.urbanharvest.sg/

2.9 Participants are encouraged to create 3D design models to showcase their design process. Design models can be created using any 3D modelling software.

2.10 Participants are highly encouraged to use recyclable materials or repurposed materials to build their Indoor Smart Gardening System.

2.11 The use of electrical, battery-powered and microcontroller systems are allowed.

2.12 Exposed wires, gears and belt drive must have a casing for safety.

2.13 Existing off the-shelve gardening planter kit are not allowed.

2.14 The prototype size should not exceed **40 cm (Length) x 30 cm (Width)**

2.15 The competition is open to all Secondary School students in Singapore.

2.16 The number of students in each team should not exceed more than five*.

2.17 Each individual or team shall submit only one entry.

3. Planter Workshop & Learning Resources

3.1 There will be a workshop held in Singapore Polytechnic for participants to build a small Planter and learn the importance of urban farming.

3.2 Students are highly encouraged to attend the Planter Workshop held in Singapore Polytechnic.

3.3 Student leaders will be able answer questions and give advice on the competition rules during the workshop

3.4 Participants will be informed of the date of the Planter workshop separately.

4. Competition Details & Prizes

4.1 The submitted entries will be judged and ranked by a panel of judges formed by the organising committee.

4.2 The awards are:

1st Prize	$500 Cash Voucher* + Trophy for School
2nd Prize	$350 Cash Voucher* + Trophy for School
3rd Prize	$200 Cash Voucher* + Trophy for School
Design Award	$100 Cash Voucher*
5 Merit Awards	$100 Cash Voucher*
Commendation Awards for all deserving entries ($50 Cash Voucher* each)	

*The committee reserved the rights to replace cash vouchers with other awards of similar value.

4.3 Design Award – the award will be awarded to the team with the best design based on the votes of the organising committee, teachers and representing schools.

4.4 All participating students will be presented with certificates.

5. Judging Criteria*

Item	Judging Criteria*	Weightage
A	Functionality	20%
B	Incorporation of Smart Technologies	15%
C	Originality and Creativity	25%
D	Sustainability	15%
E	Presentation	25%
	TOTAL	**100%**

6. Registration & Final Submission

6.1 Participants are to register their interest to their teacher I/C. The teacher I/C shall collate and submit to the Organising Committee online by clicking on this URL link -> Registration for Engineering Challenge 2023 | FormSG

6.2 Closing date for competition registration is on **26/05/2023.**

6.3 All participants should submit their entries by **06/09/2023**.

6.4 Each team's submitted entry must include:

- The physical model
- Presentation Materials - must be in **electronic format only**. (This is to avoid printing of paper-based presentation materials.)

6.5 There will be a judging day where each team is required to give a 5 - 10 minutes presentation on their submitted entries to a panel of judges. Details of the judging day arrangement will be made known to participants separately

6.6 All works submitted should be done by the students and should not have been awarded by the organiser of another similar competition before.

6.7 The Organising Committee or sponsor is not liable for infringement or abuse of any design as a result of the entry in this competition or as a result of subsequent publicity.

6.8 Entries that do not meet the competition rules will be disqualified.

7. Announcement of Results

7.1 The results of the Engineering Challenge will be announced at the Awards Ceremony scheduled on **7th September 2023**. The Award Ceremony details will be made known to participants separately.

7.2 Participants and teachers will be informed of the details through email.

7.3 In the event of a tie, the Organising Committee reserves the right to redistribute the prizes. All decisions made by the judging panel are final.

For more information and registration, please contact: Engineering Challenge (Design Category)

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