

2 June 2020



The Principal  
All Secondary Schools  
Attn. Science / Maths HODs / Co-ordinators





Dear Sir / Mdm

**SPECIAL SCIENCE PROGRAMMES IN YOUR SCHOOL AND ONLINE AVAILABLE NOW**

Thank you for your continuous support of our programmes over the years. Science Centre Singapore will like to offer programmes to be held either in your school or online during this post-Circuit Breaker period. There are also options for home-based learning programmes. These programmes are specially curated to be concise and relevant to syllabus.

We are offering 4 different modes of facilitation, (1) on-site in school, (2) online in school, (3) live home-based learning or (4) pre-recorded home-based learning workshops, subject to availability. Attached herewith is more information about the programmes offered and the possible modes of facilitation. Should you be interested, please scan the QR codes for programme booking.

We do encourage you to take up our programmes as they are only offered during this period at a special rate. For any enquiries or clarifications for the workshops, please contact the following managers:

<p><b>For DNA programmes</b> Ms Charissa Charissa_lin@science.edu.sg 6425 2789</p>  <p><a href="https://tinyurl.com/postcb-dna-sec">https://tinyurl.com/postcb-dna-sec</a></p>	<p><b>For Nature Science programmes</b> Dr Sharma Savita_sharma@science.edu.sg 6425 2517</p>  <p><a href="https://tinyurl.com/postcb-ns-sec">https://tinyurl.com/postcb-ns-sec</a></p>
<p><b>For Physical Science programmes and Geography programmes</b> Ms Doris Doris_chow@science.edu.sg 6425 2592</p>  <p><a href="https://tinyurl.com/postcb-ps-sec">https://tinyurl.com/postcb-ps-sec</a></p>	<p><b>For CRADLΞ programmes</b> Dr Wulf Wulf_hofbauer@science.edu.sg 6425 2716</p>  <p><a href="https://tinyurl.com/postcb-cradle-sec">https://tinyurl.com/postcb-cradle-sec</a></p>

Scan QR codes to book programmes



Thank you very much for your support and we look forward to meeting you and your students in school or online.

Yours sincerely,

A handwritten signature in black ink that reads "Anne Dhanaraj".

Anne Dhanaraj (Mrs)  
Senior Director, Education Programmes  
Science Centre Singapore

## Special Science Programmes for Secondary Schools




Please note that

- These programmes have been modified from their namesakes conducted onsite in Science Centre.
- Modifications to the programme duration can be done with special request.
- Multiple sessions of the same programme can be done either concurrently or at separate timings within the same day.
- Programmes have been tailored to exclude group work. Sufficient materials will be catered for all participants, unless otherwise stated.
- Programme items will be sanitised after every use.
- These programmes may be conducted in 4 different ways:
  - A: On-site in school: held in individual classrooms/ Science laboratories
  - B: Online in school: conducted live by an educator, with materials sent to school
  - C: Live home-based learning: conducted live by an educator during HBL week, with materials sent to school in advance
  - D: Pre-recorded home-based learning: Pre-recorded instructions and demonstrations will be sent to school in advance, together with materials for hands-on activities


Please see the table below for more information about each of the mode of delivery.

The programmes can be conducted in the following ways:

<b>Mode of delivery</b>	<b>Option A: On-site in school</b>	<b>Option B: Online in school</b>	<b>Option C: Live home-based learning</b>	<b>Option D: Pre-recorded home-based learning</b>
<b>Venue where workshop is conducted</b>	In school	In school	At home	At home
<b>Will there be an educator?</b>	Yes, physically in your school	Yes. Educator will interact with the students in the class through a livestream online session using Zoom.	Yes. Educator will interact with the students in the class through a livestream online session using Zoom.	Pre-recorded videos of the educator and experiment demonstrations
<b>Will materials for hands-on activities be provided?</b>	Yes	Depends on workshop. For workshops with materials, materials will be sent to school in advance.	Depends on workshop. For workshops with materials, materials will be sent to school in advance.	Yes, the materials will be safe for students to do independently at home. For workshops with materials, materials will be sent to school in advance.
<b>Minimum Capacity</b>	Minimum capacity of 60 students per day. However, these are not mass-based activities. The workshops will be conducted either concurrently or at different timings on the same day for each class.	Minimum capacity of 20 students per class. Unless otherwise stated.	Minimum capacity of 20 students per class. Unless otherwise stated.	Minimum capacity of 20 students per class.
<b>Other things to take note</b>	Please factor in additional 15min before the workshop start time and in between consecutive classes for set-up.	Please factor in additional 15min before the workshop start time for technical set-up.	Please factor in additional 15min before the workshop start time for technical set-up.	A pre-recorded video of the workshop and other resources will be provided to the teacher in advance to upload to school's Student Learning Space.

Mode of delivery	Option A: • On-site in school	Option B: • Online in school	Option C: • Live home-based learning	Option D: • Pre-recorded home-based learning
<b>DNA programmes</b>    <a href="https://tinyurl.com/postcb-dna-sec">https://tinyurl.com/postcb-dna-sec</a>	<ul style="list-style-type: none"> <li>• <a href="#">Amgen Biotech Experience (S1-S5)</a></li> <li>• <a href="#">Bacteria and Health (S1-S2)</a></li> <li>• <a href="#">DNA and Life (S1- S2)</a></li> <li>• <a href="#">The Puzzling Case of Professor X (S1- S2)</a></li> <li>• <a href="#">Bacteria Transformation (S3- S5)</a></li> <li>• <a href="#">Genetic Diseases (S3- S5)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Amgen Biotech Experience (S1-S5)</a></li> <li>• <a href="#">Bacteria and Health (S1-S2)</a></li> <li>• <a href="#">DNA and Life (S1- S2)</a></li> <li>• <a href="#">The Puzzling Case of Professor X (S1- S2)</a></li> <li>• <a href="#">Bacteria Transformation (S3- S5)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">DNA and Life (S1- S2)</a></li> <li>• <a href="#">The Puzzling Case of Professor X (S1- S2)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">DNA and Life (S1- S2)</a></li> </ul>
<b>Nature Science programmes</b>    <a href="https://tinyurl.com/postcb-ns-sec">https://tinyurl.com/postcb-ns-sec</a>	<ul style="list-style-type: none"> <li>• <a href="#">Climate Change and Sustainability (S1- S2)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Climate Change and Sustainability (S1- S2)</a></li> </ul>		
<b>Physical Science programmes and Geography programmes</b>    <a href="https://tinyurl.com/postcb-ps-sec">https://tinyurl.com/postcb-ps-sec</a>	<ul style="list-style-type: none"> <li>• <a href="#">Earth Sciences: Natural Hazard Crisis Management(S1 -S5)</a></li> <li>• <a href="#">Pandemic Crisis! (S1- S5)</a></li> <li>• <a href="#">Wind Turbine (S1- S5)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Pandemic Crisis! (S1- S5)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Pandemic Crisis! (S1- S5)</a></li> </ul>	

Scan QR codes to book programmes

<p><b>CRADLZ programmes</b></p>  <p><a href="https://tinyurl.com/postcb-cradle-sec">https://tinyurl.com/postcb-cradle-sec</a></p>	<ul style="list-style-type: none"> <li>• <a href="#">Introduction to Mircocontrollers 1 (Arduino C++) (S1- S5)</a></li> <li>• <a href="#">World of Spectra (S1- S2)</a></li> <li>• <a href="#">Electromagnetism (S2- S5)</a></li> <li>• <a href="#">Fun with Electronics (S2- S5)</a></li> <li>• <a href="#">Introduction to Microcontrollers 2 (Arduino C++) (S2- S5)</a></li> <li>• <a href="#">ISM Radio Robotic Vehicle (Arduino C++) (S2- S5)</a></li> <li>• <a href="#">Speed of Sound (Basic) (S2- S5)</a></li> <li>• <a href="#">Datalogging (Arduino C++) (S3- S5)</a></li> <li>• <a href="#">Distance &amp; Motion Sensing (Arduino C++) (S3- S5)</a></li> <li>• <a href="#">Optical Spectroscopy (S3- S5)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Introduction to Mircocontrollers 1 (Arduino C++) (S1- S5)</a></li> <li>• <a href="#">World of Spectra (S1- S2)</a></li> <li>• <a href="#">Electromagnetism (S2- S5)</a></li> <li>• <a href="#">Fun with Electronics (S2- S5)</a></li> <li>• <a href="#">Introduction to Microcontrollers 2 (Arduino C++) (S2- S5)</a></li> <li>• <a href="#">ISM Radio Robotic Vehicle (Arduino C++) (S2- S5)</a></li> <li>• <a href="#">Speed of Sound (Basic) (S2- S5)</a></li> <li>• <a href="#">Datalogging (Arduino C++) (S3- S5)</a></li> <li>• <a href="#">Distance &amp; Motion Sensing (Arduino C++) (S3- S5)</a></li> <li>• <a href="#">Optical Spectroscopy (S3- S5)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Fun with Electronics (S2- S5)</a></li> </ul>	
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Scan QR codes to book programmes

## A. DNA Programmes

### 1. The Puzzling Case of Professor X

<i>Levels: Sec 1 – 2</i>	<i>Duration: 1.5 hours</i>	<i>Cost: \$15/ participant</i>
<i>Available mode of delivery:</i> <i>A: On-site in school</i> <i>B: Online in school</i> <i>C: Live home-based learning</i>		

Professor X has been found dead! A suicide, an accident, possibly foul play? As the detective working on the case, something tells you things are not as simple as they seem. Will the clues reveal something even more sinister...? It is up to you to uncover the truth!

Learning objectives:

- Understand different forensic techniques.
- Identify types of fingerprints.
- Learn about blood patterns and blood pattern analysis.
- Roleplay interrogation techniques.

### 2. DNA and Life

<i>Levels: Sec 1 – 2</i>	<i>Duration: 1.5 hours</i>	<i>Cost: \$8/ participant</i>
<i>Available mode of delivery:</i> <i>A: On-site in school</i> <i>B: Online in school</i> <i>C: Live home-based learning</i> <i>D: Pre-recorded home-based learning</i>		

DNA is often described as the most important molecule of life which determines how living things look like and how they function. Ever wanted to see this extraordinary molecule? Join us in this lesson to see what DNA looks like in real life without a microscope. At the same time, help us in an interesting case study to determine the baby's biological parents and solve a major family confusion!

Learning objectives:

- Learn the structure of DNA and its importance.
  - Conduct a simple DNA extraction from plant cells.
  - Learn the basics of blood typing and how DNA determines blood type of individuals.
  - Perform simple karyotyping, blood typing\* and DNA analysis to solve a case study.
- \*Blood typing is only available as a hands-on activity for delivery Options A and B. For home-based learning, this will be done as a demonstration.*

### 3. Bacteria and Health *[No real bacteria will be used]*

<i>Levels: Sec 1 – 2</i>	<i>Duration: 1.5 hours</i>	<i>Cost: \$8/ participant</i>
<i>Available mode of delivery:</i> <i>A: On-site in school</i> <i>B: Online in school</i>		

Abdominal pain, nausea, diarrhoea and vomiting... More patients are turning up at the hospital with similar symptoms. It seems like a case of a foodborne outbreak. What is the source of the outbreak? Which type of bacteria is causing the outbreak? Take on the role of a medical investigator and help us in this race against time to solve the outbreak before more people are infected! The case study will be based on a food poisoning outbreak but will draw links to how the current COVID-19 outbreak is handled.

Learning objectives:

- Understand the differences between bacteria and virus.
- Understand how bacteria can affect our lives in both positive and negative ways.
- Identification of bacteria through their shapes and arrangements.
- Learn how to grow bacteria via plating.
- Learn about antibiotics, how they came about and how antibiotic resistance affects our lives.

### 4. Bacteria Transformation *[To be conducted in Science Lab]*

<i>Levels: Sec 3 – 5</i>	<i>Duration: 2 hours</i>	<i>Cost: \$15/ participant</i>
<i>Available mode of delivery:</i> <i>A: On-site in school</i> <i>B: Online in school*</i> <i>*Teacher needs to be trained in molecular biology and is comfortable with facilitating.</i>		

To help diabetic patients, human insulin has been mass produced by genetically engineered bacteria for many years. Genetic engineering may be controversial, yet it has its benefits. The thought of being able to genetically transform an organism is exciting yet intriguing at the same time. What exactly is genetic engineering? Come and immerse yourself in the magnificent world of genetic engineering and genetically transform bacteria to glow green (fluoresce)!

Learning objectives:

- Learn the general structure of bacteria and the importance of plasmids.
- Learn micropipetting techniques.
- Conduct a bacteria transformation experiment using heat shock method.
- Understand more about Green Fluorescent Protein (GFP) and its uses.
- Understand applications of genetic transformation.
- Grow bacteria via plating and observe the results.
- Learn the sterile techniques required when working.



## 5. Genetic Diseases [To be conducted in Science Lab]

<i>Levels: Sec 3 – 5</i>	<i>Duration: 2 hours</i>	<i>Cost: \$15/ participant</i>
<i>Available mode of delivery:</i> <i>A: On-site in school</i>		

Thalassaemia is the most common inherited single-gene disorder in the world. It is prevalent in Southeast Asia. Klinefelter syndrome affects males while Turner syndrome affects females. Both syndromes are due to chromosome mutations. What is the difference between a gene disorder and a chromosomal disorder? How can we predict the probability that an unborn child would have a genetic disorder? Find out the answers to these questions and more in this lesson.

Learning objectives:

- Understand genetic diseases such as chromosomal disorders and single-gene disorders.
- Define genes, alleles and genotype.
- Learn how to predict results of simple crosses using a genetic diagram.
- Learn micropipetting techniques.
- Understand how DNA is analysed through a technique known as agarose gel electrophoresis.
- Learn about genetic testing and its associated implications.

## 6. Amgen Biotech Experience

The Amgen Biotech Experience is an innovative science education programme that introduces students to the excitement of scientific discovery. ABE provides teachers with the loan of research-grade equipment, supplies, online resources, curriculum and professional development, to conduct genetic engineering on their own in school. There are also student workshops conducted by our Science Educators. For more information, please visit [www.amgenbiotechexperience.net/sg](http://www.amgenbiotechexperience.net/sg) or contact Charissa at [charissa\\_lin@science.edu.sg](mailto:charissa_lin@science.edu.sg).

## B. Nature Science Programmes

### 7. Climate Change and Sustainability

<i>Levels: Sec 1 – 2</i>	<i>Duration: 1 hours</i>	<i>Cost: \$8/ participant</i>
<i>Available mode of delivery:</i> <i>A: On-site in school</i> <i>B: Online in school</i>		

How will the Earth look like in the future? What can we do to mitigate climate change and pollution? In this workshop, you will be taking a closer look at how climate change and global warming affect the environment and living things, as well as the problem of plastic pollution. By understanding these real-world issues, we can actively make changes to our lifestyle to protect our Mother Earth.

Topics covered:

- Effects of global warming and rise in sea level

- Ocean acidification
- Plastic pollution
- Identification of microplastics

### **Complimentary class**

Sponsored by Temasek Foundation, Science Centre Singapore will conduct this Climate Change and Sustainability class at no charge for schools who enrol at least 200 students for the complimentary 'I am a Young Sustainability Champion' programme. The free classes are only valid for sessions held between 1 July and 31 August 2020, on a first come first serve basis. Students will learn about Sustainable Development Goal #13 (Take urgent action to combat climate change and its impact) and achieve 2 trophies for Project #14 (out of 15 for the programme) after the class.

Outstanding secondary level students from this Young Sustainability Champion Programme who are selected for Phase 2 will also receive the Young Engineers Award (Achievement) from Singapore Polytechnic.

Teachers who want the complimentary classes will need to submit your details and name list at <https://tinyurl.com/sustainabilitychampion> at least 10 working days before classes.



## **C. Physical Sciences Programmes**

### **8. Wind Turbine**

<i>Levels: Sec 1 – 5</i>	<i>Duration: 1 hour</i>	<i>Cost: \$15/ participant</i>
<i>Available mode of delivery:</i>		
<i>A: On-site in school</i>		

Students will get to make a pinwheel to attach to a motor, and if it is efficient in collecting wind, the LED attached to the motor will be able to light up. Students are also encouraged to try other designs with the motors and make their LED light up as steadily as possible.

Topics covered:

- Renewable energy
- Energy conversion

### **Complimentary class**

Sponsored by Temasek Foundation, Science Centre Singapore will conduct this Wind Turbine class at no charge for schools who enrol at least 200 students for the complimentary 'I am a Young Sustainability Champion' programme. The free classes are only valid for sessions held between 1 July and 31 August 2020, on a first come first serve basis. Students will learn about Sustainable Development Goal #7 (Ensure access to affordable, reliable, sustainable and modern energy for all) and achieve 2 trophies for Project #13 (out of 15 for the programme) after the classes.

Outstanding secondary level students from this Young Sustainability Champion Programme who are selected for Phase 2 will also receive the Young Engineers Award (Achievement) from Singapore Polytechnic.

Teachers who want the complimentary classes will need to submit your details and name list at <https://tinyurl.com/sustainabilitychampion> at least 10 working days before classes.



## 9. Pandemic Crisis! [only available from 1 July 2020 onwards]

<i>Levels: Sec 1 – 5</i>	<i>Duration: 1 hour</i>	<i>Cost: \$8 or 15/ participant</i>
<p><i>Available mode of delivery:</i>  <i>A: On-site in school (Cost: \$15/ participant)</i>  <i>B: Online in school* (Cost: \$8/ participant)</i>  <i>C: Live home-based learning* (Cost: \$8/ participant)</i>            * There will not be any materials (e.g. worksheets) sent to the school/students. Each student will need a mobile device (tablet/laptop) for student engagement.</p>		

The Science Educator uses storytelling and roleplay to get students to think about the consequences of decision making based on our current situation. Each student is a District Minister for Beautopia trying to contain the twin crisis of both climate change and pandemic. The decision you make individually, and as a team, will decide the future of your city, what will history say about you?

Topics covered:

- Responsible decision making for sustainable living and social awareness
- Multi-disciplinary approach for logical thinking, creative problem solving, and strategy planning
- Science in the society, the environment, and daily life.

### **Complimentary facilitation**

Sponsored by Temasek Foundation, Science Centre Singapore will conduct a live facilitation by our Science Educator at no charge for schools who enrol at least 200 students for the complimentary 'I am a Young Sustainability Champion' programme. The free online facilitations are only valid for sessions held between 1 July and 31 August 2020, on a first come first serve basis. Students will learn about Sustainable Development Goals and achieve 3 trophies for Project #18 (out of 15 for the programme) after the class.

Outstanding secondary level students from this Young Sustainability Champion Programme who are selected for Phase 2 will also receive the Young Engineers Award (Achievement) from Singapore Polytechnic.

Teachers who want the complimentary facilitation will need to submit your details and name list at <https://tinyurl.com/sustainabilitychampion> at least 10 working days before classes.



## D. Geography Programmes

### 10. Earth Sciences: Natural Hazard Crisis Management

<i>Levels: Sec 1 – 5</i>	<i>Duration: 1 hour</i>	<i>Cost: \$15/ participant</i>
<p><i>Available mode of delivery:</i>  <i>A: On-site in school</i></p>		

Despite our technological advancement, we cannot eliminate casualties in the event of a disaster. Find out why by putting themselves in the shoes of a person facing a natural disaster. Active discussion will be encouraged as students learn more about what hinders evacuation efforts through the games!

Topics covered:

- Discuss the responses of people to natural hazards
- Understand how sequences of events and activities in the physical and human worlds are part of our dynamic planet and changing world

### **Complimentary class**

Sponsored by Temasek Foundation, Science Centre Singapore will conduct this Earth Sciences class at no charge for schools who enrol at least 200 students for the complimentary 'I am a Young Sustainability Champion' programme. The free classes are only valid for sessions held between 1 July and 31 August 2020, on a first come first serve basis. Students will learn about Sustainable Development Goals and achieve 2 trophies for Project #6 (out of 15 for the programme) after the class.

Outstanding secondary level students from this Young Sustainability Champion Programme who are selected for Phase 2 will also receive the Young Engineers Award (Achievement) from Singapore Polytechnic.

Teachers who want the complimentary classes will need to submit your details and name list at <https://tinyurl.com/sustainabilitychampion> at least 10 working days before classes.



## **CRADLΣ Programmes**

### **11. Fun with Electronics**

<i>Levels: Sec 2 – 5</i>	<i>Duration: 1 hour</i>	<i>Pax: Min 10</i>	<i>Cost: \$20/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			
<i>C: Live home-based learning</i>			

Electronics is the science of controlling electrical energy in the form of electrons by circuits that are built with electrical components. These smart gadgets play a vital role in building our 21st century technology. In this workshop, students will be introduced to several basic electronic components (resistors, LEDs, transistors) and build electronic circuits utilising their properties on a breadboard (prototyping board). They will also get to assemble and bring home their own touch sensor box based on concepts learnt.

### **12. Optical Spectroscopy**

<i>Levels: Sec 3 – 5</i>	<i>Duration: 1.5 hours</i>	<i>Pax: Min 10, Max 20</i>	<i>Cost: \$30/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

Spectroscopy is a class of techniques that investigates how radiation (such as, but not limited to light) is affected by interactions with matter. Our understanding of the world is largely based on spectroscopy – for example, many chemical elements were first discovered through their spectra, and our knowledge how atoms and molecules are built has been almost entirely derived from spectroscopic observations. In this non-mathematical workshop, students build their own

spectroscopes (which they can keep and use for further investigations) and use them to observe spectra of various light sources, culminating in the observation of Fraunhofer spectral lines in daylight. The characteristic properties of different types of spectra (atomic, molecular and solid-state origin) are qualitatively explained.

### 13. World of Spectra *[only available from 1 July 2020 onwards]*

<i>Levels: Sec 1 – 2</i>	<i>Duration: 1 hour</i>	<i>Pax: Min 10</i>	<i>Cost: \$20/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

Much of our understanding of the world originates from investigating visible light. In this workshop, students assemble take-home cardboard spectroscopes and use them to explore the surprising variety in the composition of light (i.e. different colours/ wavelengths) from common sources. This workshop is targeted at lower secondary students and aims to cultivate their interest in using basic physical phenomena as tools for scientific exploration.

### 14. Electromagnetism

<i>Levels: Sec 2 – 5</i>	<i>Duration: 1.5 hours</i>	<i>Pax: Min 10, Max 20</i>	<i>Cost: \$20/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

Electromagnetism is responsible for many phenomena encountered in our daily lives. While it was first discovered by Hans Christian Ørsted, it was Michael Faraday's breakthrough in 1821 that propelled electromagnetism into modern applications. He successfully built two devices to produce "electromagnetic rotation", one of which is now known as the homopolar motor. He further discovered electromagnetic induction and all these led to the foundation of modern electromagnetic technology, i.e. motors and generators. In this workshop, students will learn the basics of electromagnetism, make their own homopolar motor and experience the phenomenon of electromagnetic induction. Students will be able to observe and investigate the turning effect on a current-carrying coil and the effects of a changing magnetic field on a conductor.

### 15. Speed of Sound (Basic)

<i>Levels: Sec 2 – 5</i>	<i>Duration: 1 hour</i>	<i>Pax: Min 5, Max 12</i>	<i>Cost: \$15/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

We use sound for numerous purposes such as to communicate with people, for entertainment (music and movies) and even as a second form of sight. In physics, sound is an excellent model

for introducing wave phenomena in general. In this workshop, students will learn to use an oscilloscope to measure the time it takes sound to travel for a given distance, and accurately determine the speed of sound.

### 16. Introduction to Microcontrollers 1 (Arduino C++)

*[Schools will need to provide computer and have arduino software installed]*

<i>Levels: Sec 1 – 5</i>	<i>Duration: 1.5 hours</i>	<i>Pax: Min 10, Max 20</i>	<i>Cost: \$20/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

Microcontrollers are integrated circuit (IC) chips that are able to process input and control machines and devices based on their written program. In our current lifestyle, we can find microcontrollers used in devices such as rice cookers, washing machines, remote controls, etc. In this workshop, participants will get to expose to C++ programming language and write simple programs using Arduino’s Integrated Development Environment (IDE). They will build circuitry on a breadboard using simple components such as buzzer, light-emitting diodes (LEDs) and light dependent resistor (LDR).

### 17. Introduction to Microcontrollers 2 (Arduino C++)

*[Schools will need to provide computer and have arduino software installed]*

(Pre-requisite: Introduction to Microcontrollers 1 or equivalent)

<i>Levels: Sec 2 – 5</i>	<i>Duration: 1.5 hours</i>	<i>Pax: Min 10, Max 20</i>	<i>Cost: \$20/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

Building on the previous workshop, Introduction to Microcontroller 1, participants will be introduced to more electronic components. For example, they will learn how to use a potentiometer to control a RGB LED to create a home mood lighting system. Participants will also be expose to more advanced programming syntax such as conditional loops and map function.

### 18. Distance & Motion Sensing (Arduino C++)

*[Schools will need to provide computer and have arduino software installed]*

(Pre-requisite: Introduction to Microcontrollers 1 & 2 or equivalent)

<i>Levels: Sec 3 – 5</i>	<i>Duration: 1.5 hours</i>	<i>Pax: Min 5, Max 12</i>	<i>Cost: \$30/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

In this workshop, participants will learn about the science behind the different distance and motion sensors and integrate them with components learnt in the Introduction series to come up with real-life applications. Further applications to these sensors can be found in the field of robotics.

### 19. Datalogging (Arduino C++)

*[Schools will need to provide computer and have arduino software installed]*

(Pre-requisite: Introduction to Microcontrollers 1 & 2 or equivalent)

<i>Levels: Sec 3 – 5</i>	<i>Duration: 1.5 hours</i>	<i>Pax: Min 5, Max 10</i>	<i>Cost: \$30/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

Data logging is a common application in many science laboratories. In this workshop, participants will learn how to integrate micro-controllers, sensors and data storage devices to make their very own data loggers.

### 20. ISM Radio Robotic Vehicle (Arduino C++)

*[Schools will need to provide computer and have arduino software installed]*

(Pre-requisite: Introduction to Microcontrollers 1 or equivalent)

<i>Levels: Sec 2 – 5</i>	<i>Duration: 1.5 hours</i>	<i>Pax: Min 5, Max 12</i>	<i>Cost: \$30/ participant</i>
<i>Available mode of delivery:</i>			
<i>A: On-site in school</i>			
<i>B: Online in school</i>			

Robotics is a fast growing industry that is estimated to be worth tens of billions of dollars. Using the Arduino Uno and the Radio Communication Module, participants will learn to send messages between two microcontrollers wirelessly. This technique can be used in many applications such as datalogging, robotics and telecommunications. In this workshop, participants will control the vehicle via radio communications.