Discover Engineering
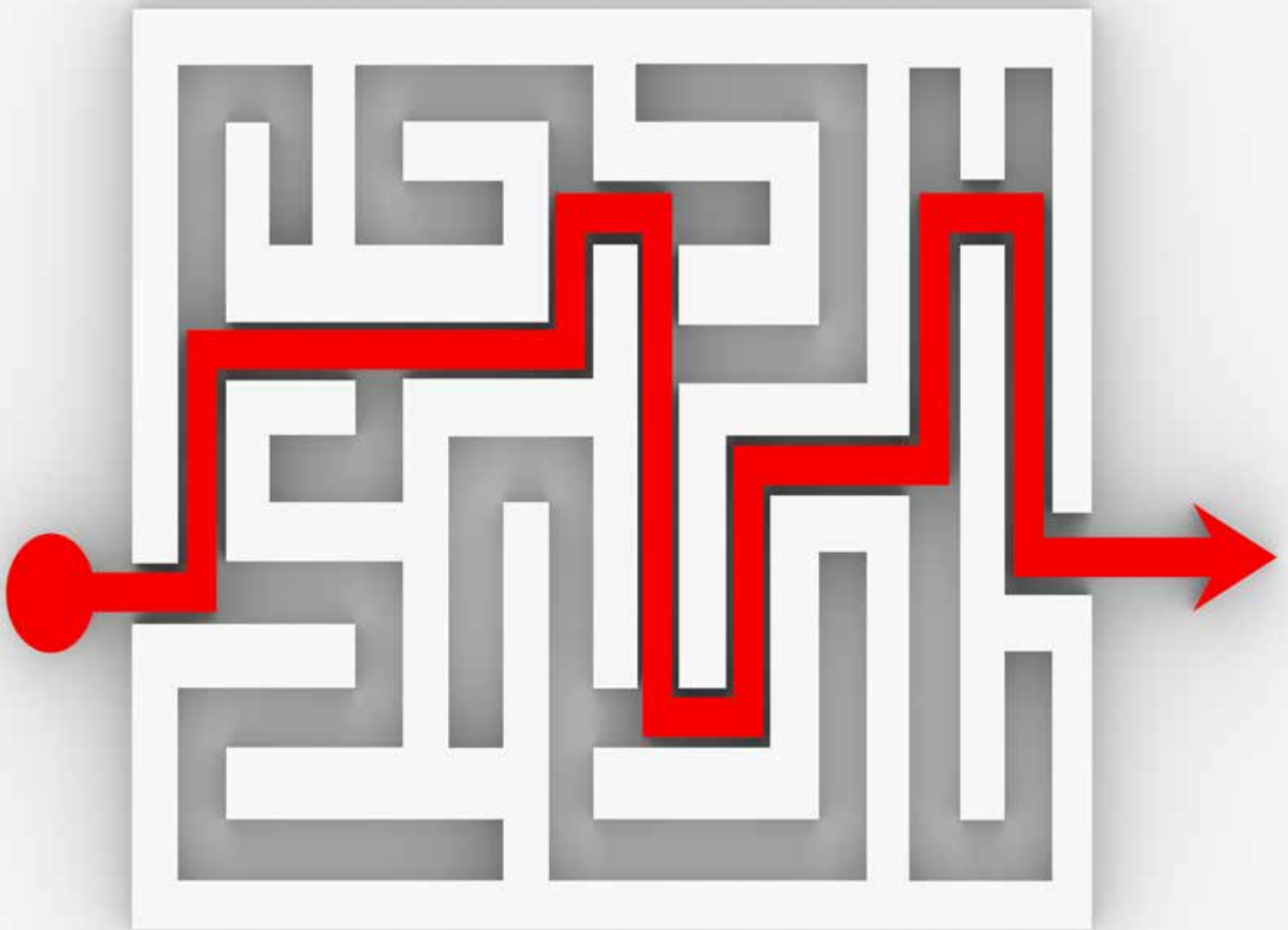## @ Temasek Polytechnic

Professional Development Workshops for Teachers
&
Workshops Students

Temasek
POLYTECHNIC

School of Engineering

2023

Foreword

Teachers' Workshop Series

At the School of Engineering, we have started curating professional development workshops for school teachers, with the aim to equip teachers with knowledge on new technologies and experiences so that they too can apply them in their course of work or share them with their students.

Workshops for Students

We also welcome schools to organize learning journeys for students to attend enrichment workshops or short courses, as well as visit our Centres of Excellence. Such journeys would definitely create awareness among students of the many opportunities in the exciting world of engineering.

Do get in touch with our Co-ordinator, Ms Lily Sing, to arrange for a course or a visit.

Please contact:
    Ms Lily Sing
    Email: Lily_SING@tp.edu.sg
    Tel: 6780 5406

See You!

Outreach Team
School of Engineering
Temasek Polytechnic

PS: During TP's term time, workshops and visits on Wednesday and Friday afternoons are preferred, as resources are more readily available.

At a Glance

Teachers' Workshop Series

We have started this professional development program for teachers with 3 workshops. We hope to introduce more interesting ones in the near future.

1. Model Your Physics Lessons
2. Augmented Reality for Beginners
3. Chatbot Development for Non-Programmers

Workshops for Students

Duration of these workshops is typically about 1.5 to 2hrs -- ideal for a morning or an afternoon visit to TP.

Built Environment Workshops

1. Introduction to Digital Architecture
2. Design Your Zero Energy Classroom
3. Fun with Light and Shadow Simulation
4. Peek into Sustainable Architecture & Engineering
5. Visualize Like a Built Environment Professional
6. Facility Management with BIM

Aerospace & Aviation Management Workshops

7. Introduction to Aviation Management
8. Appreciating Aviation & Aerospace

Healthcare & Biomedical Engineering Workshops

9. From Genome to Proteome
10. Healthcare Analytics – Basic Supervised Machine Learning
11. Make Your Own Paper Soap

Programming/Electronics/Robotics/Automation Workshops

12. Making Things Smart
13. Programming and Control Made Easy
14 Introduction to Python
15. Fun with Cobots
16 Fun with Electronics
17. Fun with Microcontrollers
18. Build a Rain Water Detector

At a Glance

Short Courses

These short courses for students typically require 1 to 3 days.

1.   Printed Circuit Board (PCB) Design (1~2-day course)
2.   Build a Line-Tracking Robot (1~2-day course)
3.   Applied Learning Modules (3-day course)
   • Behind the Scenes: The Making of Electronic Gadgets
   • Introduction to Aviation & Aerospace
   • Appreciating 3D Printing with Mechatronics
   • Smart IoT Devices and Virtual Reality
   • Sustainable Design and Management
   • Innovative and Fun Engineering

Centre Visits

Include a visit to one or two of our Centres of Excellence in your itinerary to learn about developments in different technology areas. Visit to each centre takes about 20 to 30 mins.

1.   TP-HRG Robotics and Innovation Centre
2.   Clean Energy Research Centre
3.   Healthcare Engineering Centre
4.   Digital Fabrication and Additive Manufacturing Centre
5.   Advanced Manufacturing Centre
6.   Integrative Built Environment Centre
7.   TP-Lufthansa Technical Training Centre

Teachers' Workshop Series

1.   Model Your Physics Lessons

Physics, to some students, is a subject 'difficult' to learn. This is usually because the students could not 'visualize' and relate the many concepts to their daily life. If educators can demonstrate the concepts and principles right in front of the class, students would appreciate the subject a lot more.

In this half-day interactive hands-on workshop, participants will be introduced to several physics models/kits used to demonstrate concepts like reflection, refraction, total internal reflection, wave motion, etc. At the end of the workshop, participants can bring the models back for their own use in their classrooms.

Target Audience: All Secondary School Science (Physics) teachers, teaching assistants, TSOs
Duration: Half day
Course Dates: March/May/Jun/ July/ Sep/Oct/ Nov (Date is negotiable)
Pax: 12   **Cost:** TBC

2.   Augmented Reality for Beginners

This workshop introduces participants to the use of immersive media especially Augmented Reality (AR) and the commonly used tools available in the market to develop the AR application (app).

Participants will be guided in the hands-on session to develop AR prototypes with the aim of introducing the technology into their own organisation.

Target Audience: Individuals keen to acquire competency in developing AR app. No or little programming background is required.
Duration: 1 day
Course Dates: Jun/ July/ Sep/ Nov (Date is negotiable)
Pax: 12   **Cost:** TBC

3.   Chatbot Development for Non-Programmers

Chatbots are computer programs that use Artificial Intelligence to answer queries. They can vary from a simple database of questions and answers to massively complex problems which use dynamic data.

They are more efficient and effective compared to static Q&A. They also reduce labor cost and improve productivity.

This workshop introduces participants to chatbot development using cloud service tools. Participants will be guided to develop a chatbot in a hands-on lab session and learn how to integrate the chatbot to 3rd party applications.

Target Audience: Any individual who is interested in creating a chatbot to assist in queries related to learning or customer experience. No programming background is required
Duration: 1 day
Course Dates: Jun/ July/ Sep/ Nov (Date is negotiable)
Pax: 12   **Cost:** TBC

Built-Environment Workshops

1.   Introduction to Digital Architecture

Students will learn to create and render a building design model using a Building Information Modelling (BIM) software. They will have hands-on to be an architect for a day.

Duration: 2hrs   Class Size: 20~25 pax

Digital Architecture

2.   Design your Zero Energy Classroom

There are many ways to make buildings energy efficient so as to save costs and leave a smaller carbon footprint. This workshop culminates with a creative design activity where students attempt to design a classroom that requires zero energy!

Duration: 2hrs   Class Size: 20~25 pax

Zero Energy

3.   Fun with Light and Shadow Simulation

Architects use simulation extensively to study how attributes of a building, such as its orientation, building materials used and even the usual wind direction, affect the energy consumption even before it is built. In this workshop, students will experiment, perform simulations and learn to analyze the results.

Duration: 2hrs   Class Size: 20~25 pax

Fun with Light and Shadow

4.   Peek into Sustainable Architecture & Engineering

Start your journey towards a Sustainable Future! This workshop introduces concepts of "Sustainable Engineering Design". Students will brainstorm and propose ideas for their "Dream Green School".

Duration: 2hrs   Class Size: 20~25 pax

TP's Building with Green Roof and Wall

5.   **Visualize Like a Built Environment Professional**

What roles do engineers and architects have in the built environment industry? How do architectural drawings facilitate the communications between these 2 parties? Find out which role you are more inclined to.

Duration: 2hrs   Class Size: 20~25 pax

Architects vs Engineers

6.   **Facility Management with BIM**

A SMART nation can be built using a model-based process called Building Information Modelling (BIM). Learn how facility managers use a BIM tool to design and maintain a small facility.

Duration: 2hrs   Class Size: 20~25 pax

Smart Design and Maintenance

Aerospace & Aviation Management Workshops

7.   **Introduction to Aviation Management**

Students will be taken on a journey to get a glimpse of what they would learn in the course – from flight operations to airport management, and then to the basic flight controls of a plane.

Duration: 2hrs   Class Size: 18~20 pax

Airlines, Airports, Airplanes

8.   **Appreciating Aviation & Aerospace**

Want to know more about the roles that you can assume in the aviation and aerospace sector? Get enlightened on some of the "best jobs" and "hidden careers" in the industry! We will take you on a tour of our hangar to view some of our aircraft systems, share with you what makes a drone fly and then hand over the controls of a drone flight simulator to you!

Duration: 2hrs   Class Size: 18~20 pax

Bird's Eye View

Healthcare & Biomedical Engineering Workshops

9.   From Genome to Proteome

You will learn the basics of genomics. Genes store a vast amount of information and gene activities can bring about illnesses and diseases. You will learn in this workshop how genetic information in cells can be decoded by studying the protein composition using biomedical equipment.

Duration: 2hrs   Class Size: 20~25 pax

Genome to Protome

10.   Healthcare Analytics – Basic Supervised Machine Learning

In this workshop, you will learn the basics of supervised machine learning. You will learn about logistic regression and how to transform the "logit" function to the "sigmoid" function. You will then teach your machine to analyse data – such as a set of cancer data, so that whenever it is given a new data set, it is able to predict whether a tumour is likely to be malignant or benign.

Duration: 2hrs   Class Size: 20~25 pax

Supervised Machine Learning

11.   Make Your Own Paper Soap

Frequent hand washing helps to prevent the spread of infectious diseases. But sometimes, soap may not be readily available at the washrooms of shopping malls or food-court. In this workshop, you will learn how to make your own "paper soap" that is portable – so that you have soap whenever you need it.

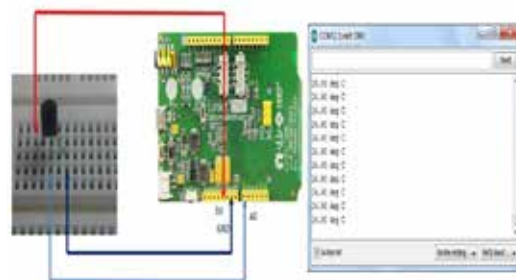Duration: 2hrs   Class Size: 20~25 pax

Washing with Paper Soap

Programming/Electronics/Robotics/Automation Workshops

12.   Making Things Smart

Students will learn to build a smart system that can gather data from different sensors and then make an intelligent decision.

Duration: 2hrs   Class Size: 20~25 pax

Smarter Things

13.   Programming and Control Made Easy

In this workshop, students will be given an overview of microcontrollers and Internet of Things (IoT). Students will be guided to program their microcontroller and enable their "Thing" to communicate through the Internet.

Duration: 2hrs   Class Size: 20~25 pax

Equipping Things with Internet

14.   Introduction to Python

This is a beginners' course to the Python language. Students will learn the basic syntax of the language, know where Python can be used and the reasons for her huge popularity. Students will be able to explore further on their own after the course.

Duration: 2hrs   Class Size: 20~25 pax

Why Python?

15.   Fun with Cobots

Cobots are robots designed to work safely alongside people. This workshop aims to introduce you to the world of Cobots. You will learn to program and operate these robots with a Teach Pendant (Tablet) and get to see the possibilities of using such robots at our TP Robotics and Automation Centre (RAC).

Duration: 2hrs   Class Size: 20~25 pax

Fun with Cobots

16. Fun with Electronics

Students will have hands-on practice to assemble their own electronic circuit by soldering components onto a Printed Circuit Board. Students will learn to read circuit schematics, identify the different electronic components and acquire awareness of product development.
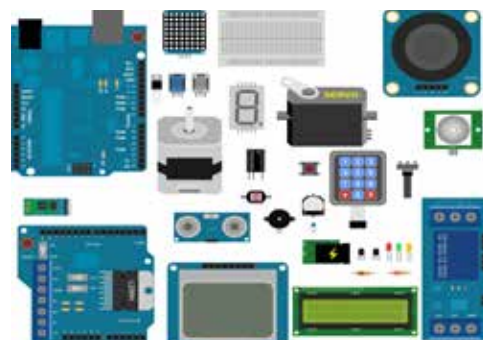
Duration: 2hrs   Class Size: 20~25 pax
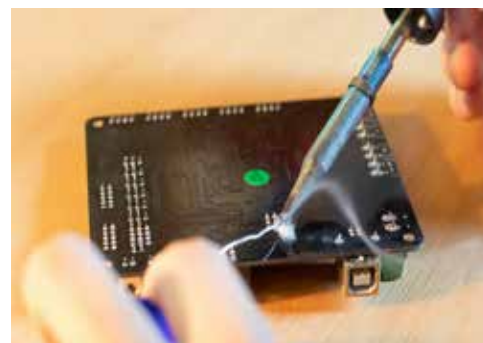
Fun with Electronics

17. Fun with Microcontrollers

This is an introductory workshop to micro-controllers. Students will learn to write simple programs for the Arduino Uno board to control motors, capture readings from sensors and move a simple robot.

Duration: 2hrs   Class Size: 20~25 pax

Fun with Micro-controllers

18. Build a Rain Water Detector

Do you have to bring in the laundry or close the windows whenever it rains? This gadget will alert you to do just that. You will learn how a transistor and a few other electronic components should be used. You will have hands-on to patch a circuit on a breadboard.

Duration: 2hrs   Class Size: 20~25 pax
Remarks: Available as a virtual workshop as well.

Rain Water Detector Kit

Short Courses

1.   Printed Circuit Board (PCB) Design

Everyone can design and fabricate PCBs easily these days. We will guide you through the process of Schematic Capture, PCB Layout and manufacturing data generation using Autodesk's Eagle software. You can then fabricate the design using our PCB milling machines. Finally, solder your own board and bring home a working prototype.

Duration:1~2 days   Class Size: 20~25 pax

PCB Design

2.   Build a Line-Tracking Robot

This is a hands-on workshop where students will be given a jump start to building a line tracking robot. Students will learn how the different parts of the robot - line-sensors, motors, driver and the micro-controller -- should be integrated, so that the robot can fulfil its role.

Duration:1~2 days   Class Size: 20~25 pax

Line Tracking Robot

3.   Applied Learning Modules@Poly

School of Engineering currently offers the following courses.

• Behind the Scenes: The Making of Electronic Gadgets
• Introduction to Aviation & Aerospace
• Appreciating 3D Printing with Mechatronics
• Smart IoT Devices and Virtual Reality
• Sustainable Design and Managment
• Innovative and Fun Engineering

For a complete listing of ApLM@Poly, please refer to: https://www.tp.edu.sg/landing/educators/aplm.html#all-schools

AEM- 3D Printing

Duration: 3 days   Class Size: 20~25 pax
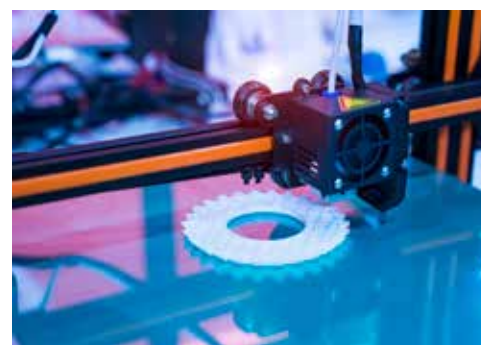
Centre Visits

Here are some suggestions of Centres to visit:

1. **TP-HRG Robotics and Innovation Centre**

    Setup in collaboration with HRG (Singapore), you will find an array of robots here -- robots that can dispose bombs, fight fire, deliver food, assemble products, etc. Soon, they will be part of our everyday lives.

2. **Clean Energy Research Centre**

    Learn about Hydrogen Fuel Cells, Solar Cells, Power Monitoring Systems and even Electric Vehicles. Check out TP's eco-car that has taken the top spot in the annual Shell Eco-Marathon Race the last few years.

3. **Healthcare Engineering Centre**

    What are BioMEMS (Biomedical micro-electro-mechanical systems) based healthcare devices and systems? Learn about biosensors, microfluidics and wearable healthcare sensors here.

4. **Digital Fabrication & Additive Manufacturing Centre**

    Need to do 3D scan of objects and then replicate them? You will find all the necessary equipment here. Need to replicate a tooth? You can always 3D-print one here too.

5. **Advanced Manufacturing Centre**

    You will see high speed, configurable production lines and warehousing system. And from start to finish, everything can be remotely monitored and controlled. Be ready for Industry 4.0!

6. **Integrative Built Environement Centre**

    Digital technologies are widely used in architectural design and systems monitoring. Learn how buildings and their installations, such as aircon chillers, lifts and elevators, are kept safe and energy efficient.

7. **TP-Lufthansa Technical Training Centre**

    Students hone their hand skills to the industry's standards here. Get to know what their training involves and then visit the hangar to see some of our aircraft systems.

Hi! Look for me at TP-HRG RIC

More information on our Centers can be found here:

https://www.tp.edu.sg/research-and-industry/centres-of-excellence/centres-under-school-of-engineering.html