

I CAN **ENGINEER** SOLUTIONS FOR

**CLEANTECH
& BUILT ENVIRONMENT**



**HEALTHCARE
& WELLNESS**



**INDUSTRIAL
& AUTOMATION**



**INFOCOMM
& MEDIA**



**SP
ENGINEERING
SHOW 2018**



**TRANSPORT
& MOBILITY**



**SP TECH
TO MARKET**



SP FABLAB



**60TH
ANNIVERSARY**

**SINGAPORE
POLYTECHNIC** | **SP**

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CleanTech
& Built Environment

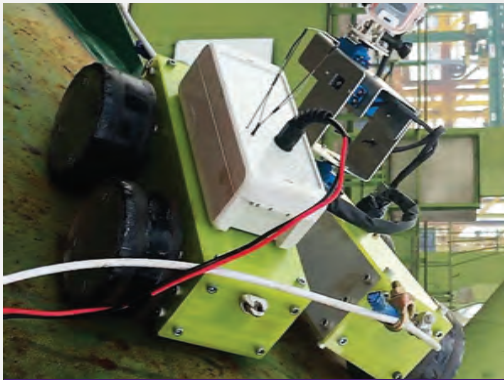
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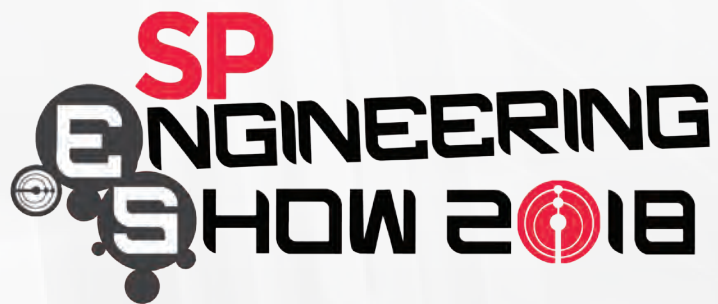
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SP ENGINEERING SHOW 2018

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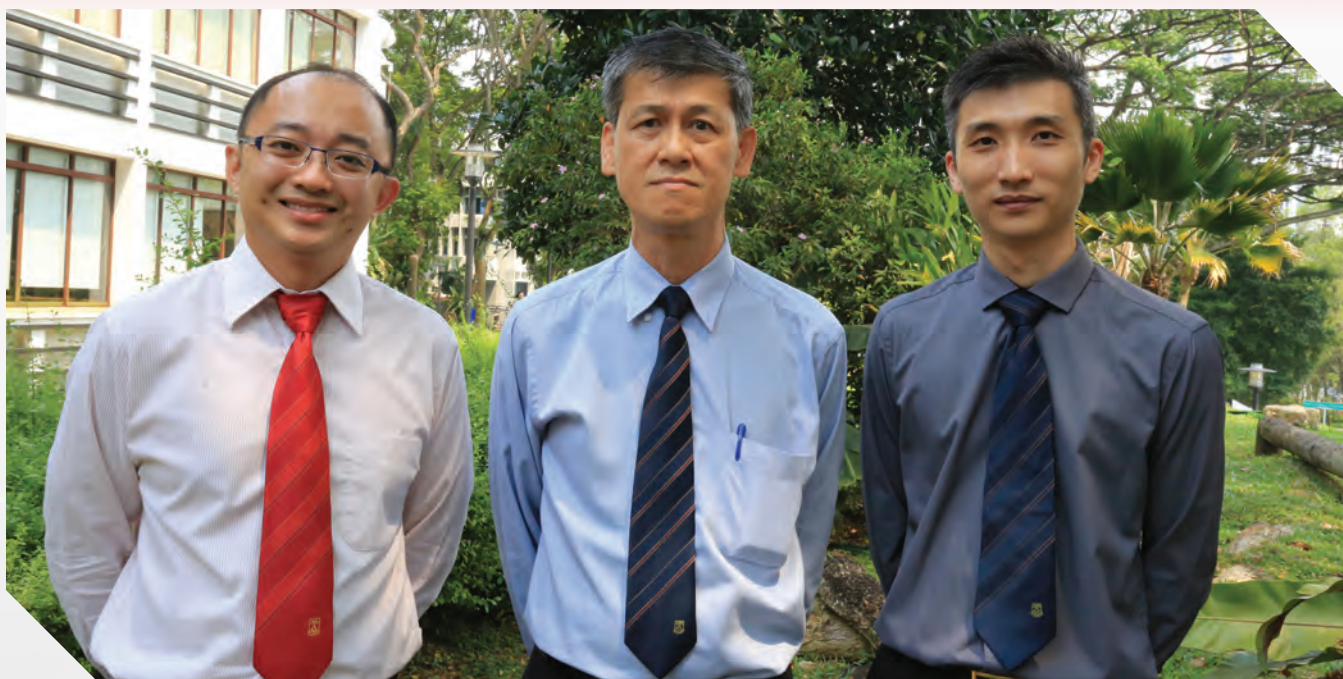
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Acknowledgement

Faulhaber Singapore Pte Ltd

CO-CHAIRMEN'S MESSAGE



From Left to Right:

Dr Tan Eng Lee

Co-Chairman
SP Engineering Show Steering Committee

Sng Hong Lian

Co-Chairman
SP Engineering Show Steering Committee

Mr Duncan Sih Wei Cheong

Co-Chairman
SP Engineering Show Steering Committee

Centre Director

TIE- Centre for Biomedical and Life Sciences

Deputy Director

School of Electrical & Electronic Engineering

Deputy Director

School of Mechanical and Aeronautical
Engineering

Welcome to the SP Engineering Show 2018.

To our final year engineering students, the SP Engineering Show is the platform to showcase their final year projects to fellow students, staff, industry visitors and the public. The projects demonstrate their efforts at innovation, using skills they have learnt in the past two and a half years to solve real world problems. It is also a chance for these future engineers to engage with industry partners on the practical applications of their projects.

The exhibition will feature a fascinating display of research and development in several areas - CleanTech & Built Environment, Healthcare & Wellness, Infocomm & Media, Industrial & Automation and Transport & Mobility. These are the efforts of our six schools – School of Architecture & the Built Environment, School of Chemical & Life Sciences, School of Electrical & Electronic Engineering, School of Mechanical & Aeronautical Engineering, School of Digital Media & Infocomm Technology and the Singapore Maritime Academy – and demonstrate the capability of our students to learn and apply the knowledge acquired in our CDIO (Conceive, Design, Implement & Operate) and Design Thinking curriculum, skills, which we are confident, will serve them well in future.

On top of that, our SP Tech to Market section showcases industry-ready ideas developed by staff from our Department for Technology, Innovation and Enterprise.

It is hoped that the SP Engineering Show 2018 will entertain you with its wide range of engineering offerings. So visit our booths and allow our students to share their efforts with you and in the process broaden their soft skills. This experience will go a long way in helping them to be work-ready, life-ready and world-ready.

We would like to express our heartiest congratulations to the organising committee, student clubs and helpers, staff, industry partners and visitors for making the SP Engineering Show 2018 a memorable event.

SP ENGINEERING SHOW WORKING COMMITTEE



Front Row

(Left to Right)

Victor Choo, Gillian Lam, Lynn Chhia, Seow Boon Chor, Duncan Sih Wei Cheong, Sng Hong Lian, Tan Eng Lee, Cheung Kim Kwong, Thio-Tang Choy Yong

Back Row

(Left to Right)

Handojo Djati Utomo, Teo Kian Hun, Chua Poh Hui, Alvin Tay, Hubertus WJ Borst Pauwels, Lee Mei Lai, Esther Kang, Jonathan Ng, Fazlur Rahman, Beh Hang Meng

Not in Picture

Bang Toong Kiang, Chan Chin Loong, Chiam Tow Ming, Chua Hui Chin, David Chai, Francis Hong, Frank Chua, Gabriel Soon, Kenny Chiang, Lee Choon Sun, Lee Yoke Ling, Leong Mun Kin, Matthew Choong, Moon Sunghan, Tan Cher Hwee, Wong Kwee Yin, Wan Kok How

SP ENGINEERING SHOW STUDENT COMMITTEE



Top Row

(Left to Right)

Md Tanvirul Huda, Mok Cheuk Lun, Shyu Zi Xun, Song Guo Quan, Tay Wei Heng Cherment, Alex Ng Boon Chye, Nigel Koh, Dominic Chua, Fong Weng Yew, Muhammad Syazwan Bin Shaiful, Sheikh Arfahmi Bin Sheikh Arzimi, Jo Hyun Jun, Abdullah Hanief Bin Vapu Maricar, Muhamad Raziq Bin Zaidi, Sebastian Siew Soon Ming, Low Chai Yee

Bottom Row

(Left to Right)

Chua Ke Qin Rachel, Farah Adilah Bte Said Bajera, Ras Tasya Sari Bte Abdul Rashid, Nur Insyirah Bte Sazali, Teh Chew Yee, Nadiah Bte Amir, Sim Shan-Ning Naomi, Siti Nur Aini Bte Shaikh Mohd Riad Alkhatib, Chai Jia Xin, Athirah Bte Hassan, Nur Hana Bte Abdul Karim, Nur Athifah Bte Mahathir

Not In Picture

Khrishnathan s/o Ravindran



CLEANTECH & BUILT ENVIRONMENT



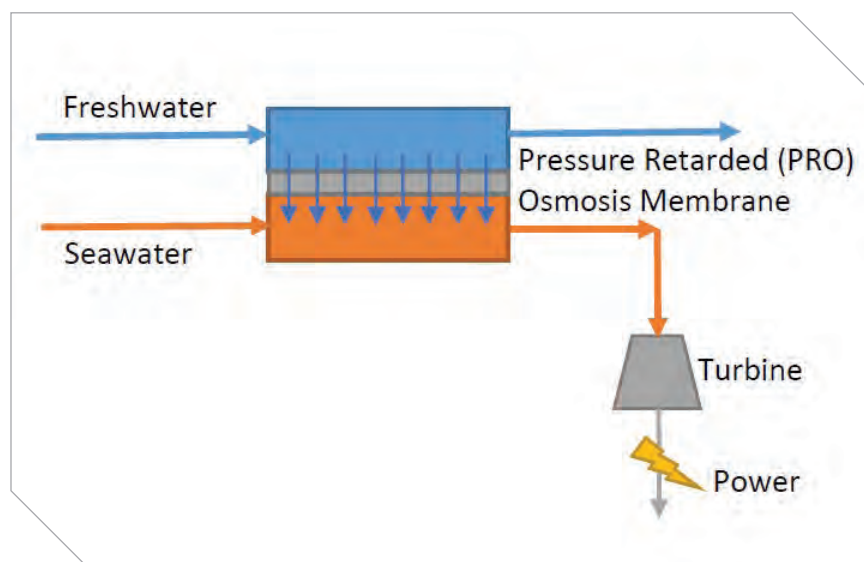
These projects use environmentally friendly technology which generates less waste and is economically competitive. Students work on increasing performance, productivity and efficiency by minimising negative effects on the environment.





Pressure-retarded Osmosis for Power Generation

A great quantity of renewable energy can be potentially generated when solutions of different salinities are mixed together. The harnessing of this energy for conversion into power can be accomplished by means of Pressure Retarded Osmosis (PRO). This technique uses a semipermeable membrane to separate two solutions with different salinities, allowing the solvent to pass to the concentrated solution side. The additional volume increases the pressure on this side which is used to drive a turbine to produce power - osmotic power. This project focuses on the design and development of a prototype to generate osmotic power via PRO.



Supervisor:

Tin Pei Shi

Team Members:

Syed Hafiy Suhaimi Bin Syed Jaffar Aljunied,
Tan Sheng Chong Darren,
Andrew Chong Jie Loon

Schematic of Osmotic Power Generation via Pressure-Retarded Osmosis Process.

Smart Energy and Sensing Network for a Smart Clubhouse

The objective of the project is to design and build a smart human-exercise-powered energy system and an environment-sensing data live-monitoring-and-management IOT network for a green, cost-effective, safe, healthy and fun smart clubhouse. The project is associated with an SP Iconic Project on building a smart clubhouse.



Supervisors:

Jiang Hao, Teo Shin Jen

Team Members:

Low Jun Qian, David Santoso,
Kabeta Takuma, Melvin Ryan,
Lim Thian Yew, Seah Zhi Xuan,
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Industry Partner:

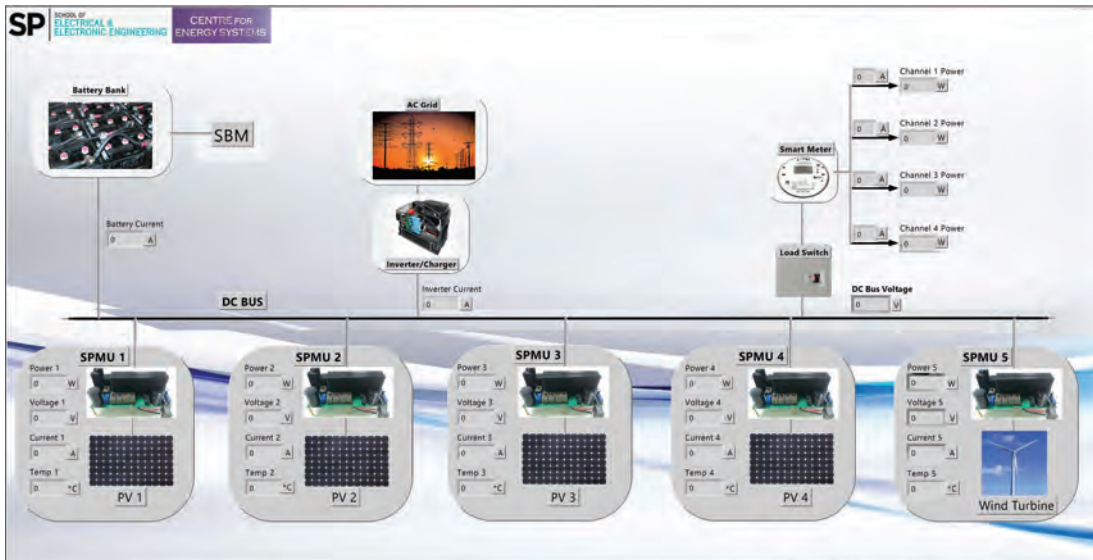
Singapore Polytechnic Graduates' Guild

Human-exercise playstation - gaming for fun, exercising for health and harnessing green energy for a better environment.



Improvement Of Graphical User Interface For DC Microgrid

The Graphical Monitoring and Control System (GMCS) is used to monitor and control the operation of a DC Microgrid. It can communicate with various sensors and devices in the DC microgrid to collect real time operation data, display the data in an intuitive method and provide a graphical user interface (GUI) for users to control the operation of the DC microgrid. This project aims to enhance the existing graphical user interface for the DC Microgrid by improving the LabView monitoring and control algorithm. It also realizes the system control through internet.



Supervisor:
Wang Huaqian

Team Members:
Tan Hui Pin Alicia,
Addie Tan Bee Hong,
Chen Peisi Jasmine

Graphical Monitoring and Control System (GMCS) for DC Microgrid.

Sweet Sustainable Water Treatment

Sugarcane bagasse, the paper-like substance obtained from sugarcane pulp, can be used in a used water filtration system to remove organic contaminants. Using a hand pump installed column, sugarcane bagasse can be used to absorb organic contaminants such as dye. In developing countries which cannot afford membrane filtration technology, sugarcane bagasse offers a sustainable solution.



Supervisor:
Handojo Djati Utomo

Team Members:
Ayu Surya Binte Zainuddin, Koh Wee Chen,
Chin Ze Zhao Eugene

SP team who won the Sembcorp Innovation Medal of \$1000 and the Runner-Up Prize of \$5000 in the SG Junior Water Prize Competition.



Centrifuge Testing of Earthquake Induced Landslide | Lightly Calcined Clay with Cement Stabilisation

Underground construction and sea dredging result in unwanted clayey soils. Disposal of these clayey soils is challenging due to limited dumping grounds. In order to address this issue, clayey soils are usually treated with cement and reused. Lightly Calcined clay is one possible alternative. Its performance is studied in this project. Yet another way to treat clayey soils is consolidation. The other part of this project tests model consolidated clay slopes on Southeast Asia's only geotechnical beam centrifuge at NUS. The models are subjected to in-flight earthquake shaking. Slope behaviour during landslide is investigated and compared with numerical simulation.



Sample preparation.

Supervisors:

Chan Chin Loong, Teo Kian Hun

Team Members:

Dharmansyah Dinata, Zheng Ting, Lim Zhi Jie, Chan Jovan, Shermaine Heng, Leow You Hao, Wai Kai Xuan

Industry Partner:

National University of Singapore

Preparation and Characterization of Phase Change Materials (PCM) Enhanced Concrete

Phase change materials (PCMs) are regarded as a possible solution for reducing the energy consumption of buildings. By storing and releasing heat within a certain temperature range, it stabilizes indoor climate. An increase of 10°C in the air-conditioned indoor air temperature could reduce air-conditioning electricity consumption by about 3%. It has been proven that the use of PCMs in a building can reduce electricity costs by up to 20%. The research scope includes: 1. Fabrication of PCM concrete samples and its strength test according to SSEN 206. 2. Thermal properties test on PCM concrete panels.



FYP students and Their Supervisors.

Supervisor:

Tao Nengfu

Team Members:

Lim Zhi Ying, Tang Yi Ting, Stella Wang, Pheh Chyi



Development of Asphalt Premix with Recycled Materials

This project aims to evaluate the properties of bituminous paving mixtures containing recycled materials. Laboratory samples are prepared and tested to evaluate physical and performance properties of various bituminous paving mixtures incorporating recycled materials. Volumetric measurement and calculation of volumetric properties, sieve analysis of raw materials and paving mixtures are part of the mix design procedure.



Asphalt Sample from Recycled Materials.

Supervisor:

Tan Poh Seng

Team Members:

Abayata Patricia Denise Sesaldo,
Toh Jin Ying, Luther Tan Xin Kang,
Ding Baiwen, Zhang Yadong, Wang Jingyue,
Wong Zhi Ming, Lee Yong Wei

Industry Partner:

SamWoh Corporation Pte Ltd



Close up view of water purification system

Life Saver - Water Purification System Using Silicon Carbide Membrane

Safe drinking water has always been one of the primary requirements for healthy and sustainable human life. In this project, silicon carbide membrane was used as the key filtration component to design a water purification system. Solar panels were also used to provide the power for the water purification system.



Water purification system with solar panel

Photo of water purification system with solar panel.

Supervisor:

Liu Qishan

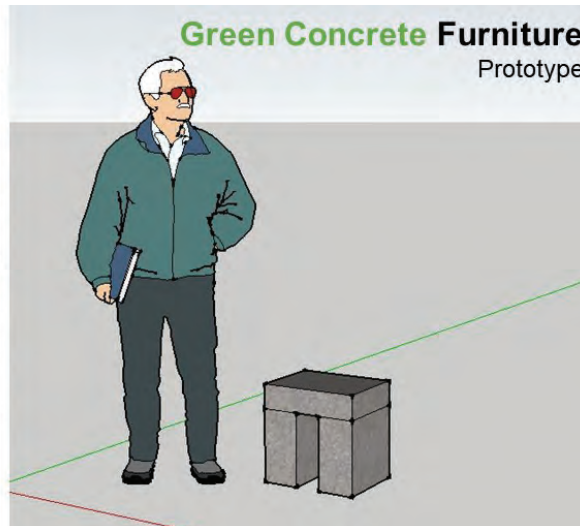
Team Members:

Sen Sheng Rong, Chang Jian Yao,
Tan Fook Aik



Go Green with Concrete

The aim of this project is to reduce the usage of natural resources, in this case, coarse aggregates, in concrete design. The research studies the use of waste materials - Hemp fibre and Kenaf core with GGBS - to replace coarse aggregate in concrete. The research determines the optimum mix design to achieve good compressive strength of the green concrete for architecture usage and furniture. The green concrete will contribute greatly towards the aim of a more sustainable built environment.



Supervisor:
Chua Yina

Team Members:
Sherman Ng Quan En, Tan Xin Ying,
Low Wei Wen Ivan, Wong Jin Yung,
Leng Xuehua, Michele Lee Jia Qi,
Liu Meiting, Zhang Jingjing

The sustainable future with Green furniture and materials for the Built Environment.

Development of Nomogram for Factors of Safety for Slopes in Singapore

Finite element programs are commonly used to analyse slope stability. However, such analyses can be time-consuming due to the complexity of the slope model. Often times, the engineer simply needs to know whether a slope is in danger of imminent failure, without resorting to building and testing a finite element model of the slope. The aim of this SP-HDB collaboration is to develop a quick-use nomogram to analyse slope stability.



Supervisors:
Teo Kian Hun, Chan Chin Loong

Team Members:
Tong Yi Song Nigels, Tan Shi Min Jayce,
Ng Wei Feng, Ong Jing Xiang Joshua,
Iman Bin Sudarnoto, Tay Hui Xin,
Lu Xiaojing, Kyran Lim Jin Xuan

Industry Partner:
Housing and Development Board

Two teams working on development of Nomogram for Factors of Safety/Flow Rate and Deformations for Slopes in Singapore.

**Supervisor:**

Teo Kian Hun

Team Members:

Jasmine Ong Shi Min, Zhu Lian,
Lee Zhi Wei, Bruce Leong

Industry Partners:

Land Transport Authority
National University of Singapore

Monitoring Ground Settlement with Remote Sensing

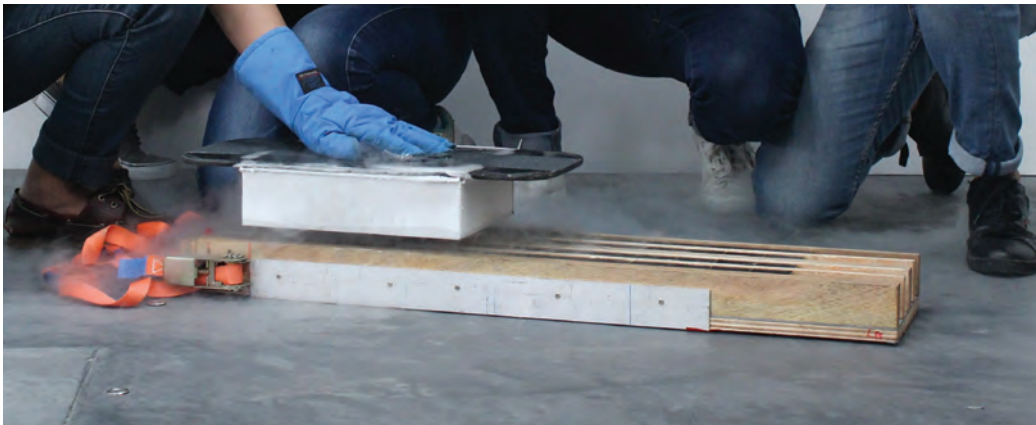
This project is part of an LTA-NUS research collaboration involving the use of photogrammetry as a remote sensing technique to measure ground surface deformation which results from underground tunnelling. This work involves taking a multitude of photographs at different angles of the surroundings with a camera to create a 3D model.



A UAV fitted with camera and GPS would be flown on a real tunneling-in-progress site.

MAG (Mechanical Anti Gravity)

MAG is a load-bearing moving platform that is mechanically powered without electricity and fuel combustion. Thus, user safety and environmental friendliness are both enhanced. Applying quantum levitation, the platform moves frictionlessly and hence minimises the need for user maintenance. This innovative technology has potential applications in the Transport & Logistics, Food & Beverage, and Recreation industries. The project can also be used for Engineering outreach programmes and as a teaching aid for modules like Thermofluids and Mechanics, offered under SP's School of Mechanical & Aeronautical Engineering (MAE).



Conducting quantum levitation test with MAG.

Supervisor:

Leong Ying Wei

Team Members:

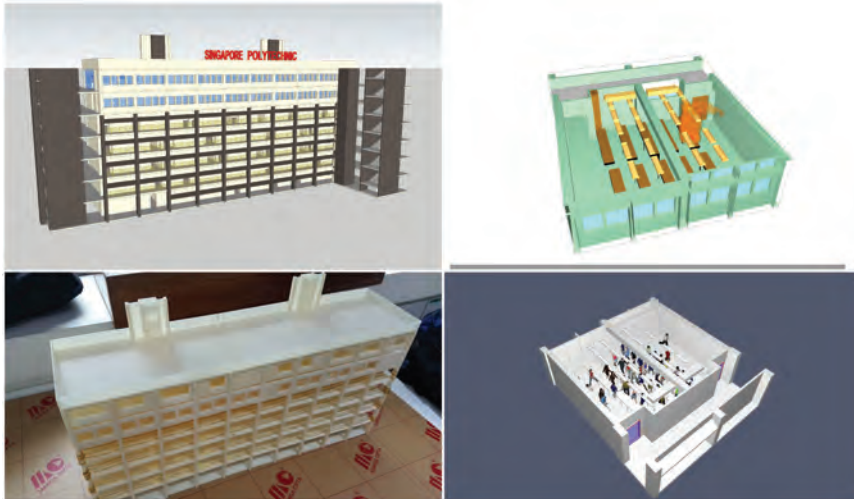
Lew Lin, Chen Xiao Wei,
Thant Zaw Aung,
Kwang Yu Yeung,
Ng Jia Jie



Creating a Sketchup Model of SP and Performing Fire Simulations on the Building

Fire safety requirements are mandatory for buildings in Singapore and are thus included in a building's development plan. This project looks at improving the workflow of the fire safety simulation process with the creation of a physical model of SP's Mechanical & Aeronautical Engineering (MAE) blocks. The fire simulation considerations included : 1) Fire spread 2) Time taken for evacuation 3) Room tenability.

Evacuation simulations were conducted to study the time taken and the routes people would likely walk to to evacuate an area. A model was created as a tool that can be used for table top fire planning.



T16 drawing and 3D printed model. Fire and evacuation simulations were then done using the drawings.

Supervisor:

Lim Chun Wheng

Team Members:

Damien Chiang Quan Hao,
Joshua Chua Yao Wei, Thay Kai Wei Jeremy,
Aaron Ng Chin Liang, Koo Chia Wei

GreenTech Leaf Sweeper System

Usage of petrol blowers in our neighbourhood, parks, gardens and park connectors to sweep or remove leaves results in the emission of harmful pollutants. The aim of this project is therefore to replace or reduce the usage of these petrol blowers in areas of human habitat and/or within recreational and sporting facilities. The GreenTech Leaf Sweeper System (GTLs) is designed to gather and remove dead/dry leaves. It can also remove lighter waste like Styrofoam or paper cups, plastic bags and containers, etc. This system is a total renewable solution as it relies on solar energy to recharge its power bank.



Leave Vacuum System.

Supervisor:

Victor Choo

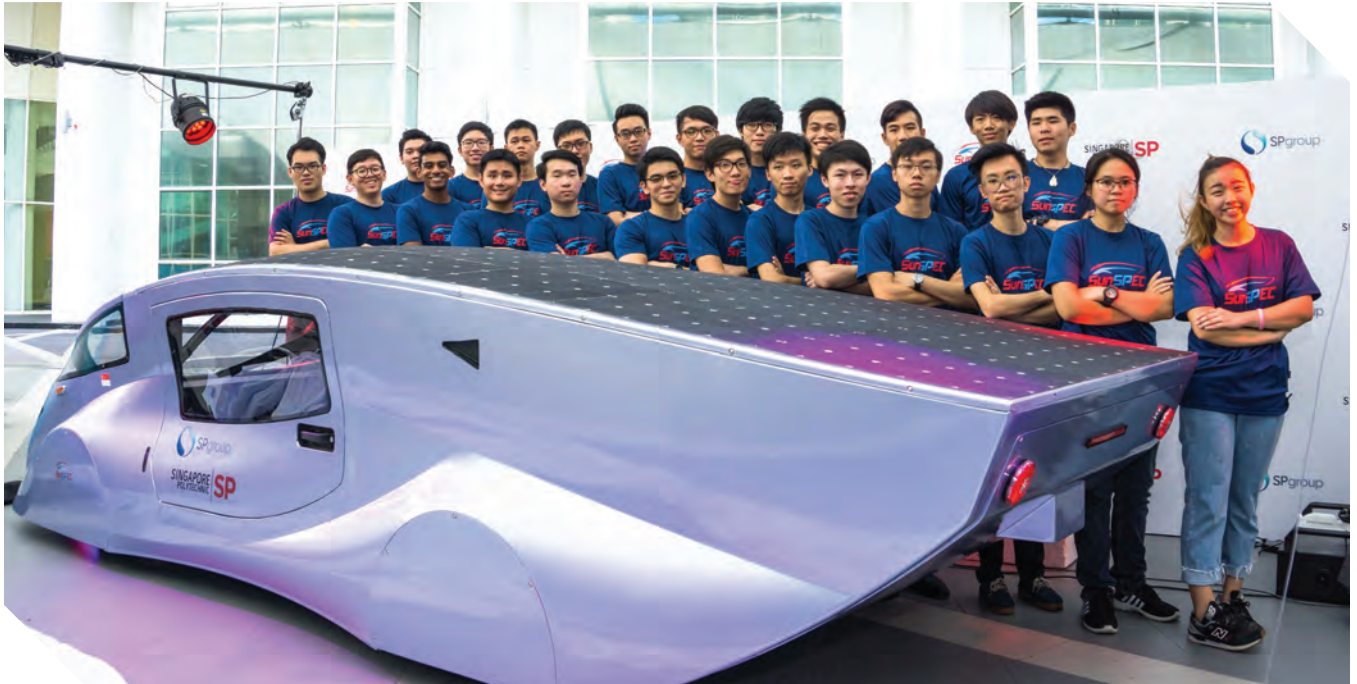
Team Members:

Tan Hao En,
Leonard Tan Jing Zhi,
Chua Rui Sheng



SunSPEC (Solar Car)

Singapore Polytechnic's latest generation of solar car, SunSPEC5, is a futuristic 2-seater fibre composite powered electric vehicle. After months of hard work and dedication from the project team, the SunSPEC5 was completed in mid-2017 and proceeded to participate in and finish a gruelling 3000km race across the Australian outback in the World Solar Challenge in October 2017. This project was established for students to participate in, develop innovative ideas and raise public awareness of renewable energy and sustainable transportation.



Singapore Polytechnic's latest generation of solar car, SunSPEC5.

Supervisors:

Chia Soo Ping, Lam Yee Ki, Than Keng Hwa,
Dilip Battul, Kenny Chiang, Foo Fang Siong,
Erwin Wouterson, Leong Fai Choy,
Steven Chew Lai Keat

Team Members:

Fong Sebert, Yat Zhi Hao, Nicanor Sow Yingjie,
Amos Wong, Heng Jerry, Chin Xiong Sheng,
Tan Min Ze Jeremy, Joey Ang Shi Yuan,
Ong Chin Yee, Koo Xuan Yang,
Amoz Goh Zheng Bin, Clement Neo Boon Wei,
Loh Yi Zhen, Abraham Baloch, Phyo Min Han,
Kyle Woo, Seow Jing Woon, Joel David Lim Jianyi,
Goh Chi Yang, Yeo Tian Shenn, Lim Jia Ren,
Lim Zheng Yuan, Sheryl Choo Ching Yee,
Krystal Wong Jie Ying, Ngah Phek Siang,
Ho Wei Sheng, Dominic Li Guoming



HEALTHCARE & WELLNESS

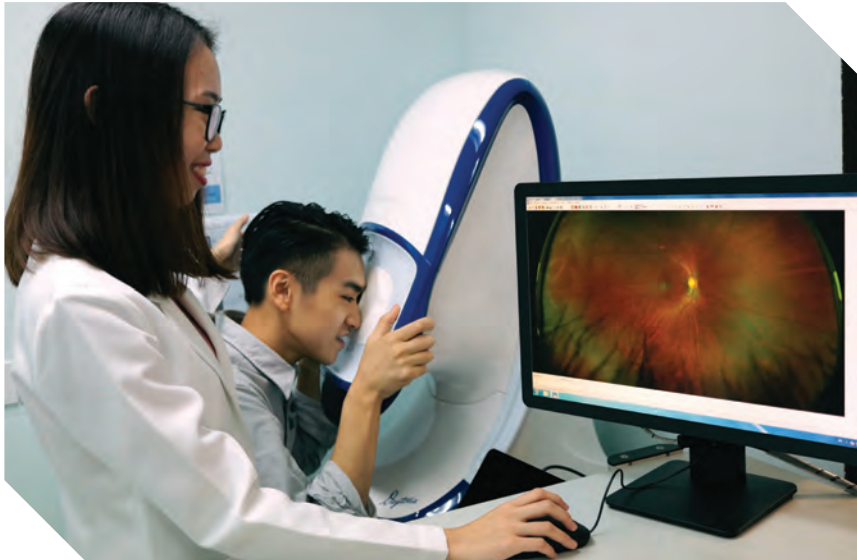
These projects help maintain an optimal level of wellness which is crucial for living a high quality life. Students will develop tailor-made integrated solutions to make a difference in people's lives.





Attitude Towards Experiential Learning Among Optometry Students

Diploma in Optometry programmes at SP have incorporated experiential learning through various means, one of which is the attachment to clinics. Attachment programmes provide students with an avenue for increased exposure and training opportunities. Therefore, it is of interest to assess the optometry students' satisfaction and perception of the attachments and its relevancy to optometry training.



We learn by doing.

Supervisor:

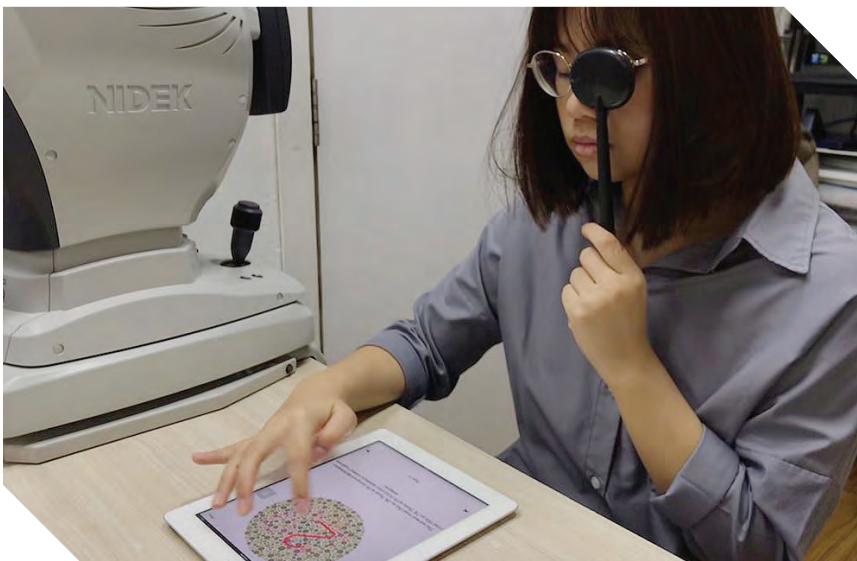
Danny Sim Chek Hoo

Team Members:

Ler Lay Suan, Lee Shao Heng Ronald,
Tan Soon Peng

Optometric Tests : Apps vs Traditional

Technology has made huge advancements in healthcare. From automated devices to healthcare applications, these innovations bring convenience to both the healthcare sector personnel and the public. The use of these innovations ranges from measuring blood sugar levels to diagnosing a condition. Currently, in the market, there are various applications and software that are able to provide diagnosis of colour vision status. However, the accuracy and reliability of these technology-driven advancements are still debatable.



Patient tracing the numbers on digital version of Ishihara Pseudo-isochromatic Plate.

Supervisor:

Raja Liyana

Team Members:

Charmaine Boi, Oh Dan Wei Serene,
Joey Sng Jing Yi, Lim Hui Xin