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Media Release

Best in Engineering Win IES Prestigious Engineering Achievement Awards 2018

Top honours go to 10 outstanding projects for making pivotal contributions to the well-being of Singapore's people and communities

The Institution of Engineers, Singapore (IES) today announced the 10 winners of the IES Prestigious Engineering Achievement Awards 2018. The awards celebrate the most outstanding accomplishments of engineers in Singapore in the past year and recognise their significant contributions to stimulating engineering progress and enhancing quality of life in Singapore.

Mr. Heng Chee How, Senior Minister of State for Defence presented the awards to the winning teams at the 12th International Conference on Ceramic Materials and Components for Energy and Environmental Applications (CMCEE 2018) Conference Dinner as the guest-of-honour, in the company of about 400 local and international guests from 46 countries.

The projects emerged from 27 submissions as winners after a rigorous round of judging by a panel of experts. The winning teams have distinguished themselves in resourcefulness in the planning and solving of design problems; pioneering use of materials and methods; innovations in planning, design and construction; and unique aspects and aesthetic values.

"Through the awards, IES hopes to raise greater awareness of the contributions of engineers to our society and economy and to inspire the younger generation to consider

engineering as the preferred career choice. We also hope that the awards will spur the winning teams to advance their work to the next level of excellence," said Prof Yeoh Lean Weng, IES President.

The 2018 awards winners are:

Applied Research and Development

- 4-IN-1 Smart Utilities Plant tailored for tropics by National University of Singapore (NUS) & King Abdullah University of Science and Technology
- Automated Needle Targeting with Medical Image Robotic Assisted Guidance Equipment (ANT-MIRAGE) by NDR Medical Technology Pte Ltd
- Bulk photovoltaics and unique UV sensors from bulk photovoltaics by Institute of Materials Research and Engineering (IMRE), a research institute under the Agency for Science, Technology and Research (A*STAR)
- Low Motion Semi: A next-generation revolutionary semisubmersible by Keppel-NUS Corporate Laboratory
- Renewable air filters from regenerating molecular building blocks by NUS Faculty of Engineering

Engineering Project

- National Gallery Singapore by CPG Consultants Pte Ltd
- Internet of Things (IoT)-enabled on-demand lighting for the Smart Nation by Housing & Development Board and ST Engineering

Technology Innovation

- Soft hybrid surgical gripper for delicate tissue manipulation by NUS Faculty of Engineering

Young Creators Award

- A 16-channel capacitive sensor interface circuits for physical signals monitoring by NUS Faculty of Engineering
- Mars Science Space Rover by Nanyang Polytechnic

The top projects will move on to receive the ASEAN Outstanding Engineering Achievement Award, a coveted accolade for engineering professionals and organisations in the region.

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Notes to media:

1. Annex

Citations – Winning projects of IES Prestigious Engineering Achievement Awards 2018

2. Chinese Glossary

English Terms	*Chinese Terms*
The Institution of Engineers, Singapore (IES)	新加坡工程师学会
IES Prestigious Engineering Achievement Awards	新加坡工程师学会卓越工程成就奖
Prof. Yeoh Lean Weng, President of IES	杨联文博士, 新加坡工程师学会会长

About The Institution of Engineers, Singapore (IES)

The Institution of Engineers, Singapore (IES) was formally established in July 1966 as the national society of engineers in Singapore. IES is the premier engineering institution in Singapore and is called upon by the Government to provide feedback on professional engineering matters.

IES is well represented among the faculty members of the major engineering institutions of higher learning in Singapore. Through close collaboration with the local universities and polytechnics, IES organises courses, seminars and talks for engineers and IES members to advance the continuous development of engineers.

The Institution maintains close links with professional organisations of engineers regionally and throughout the world. These include organisations in Australia, China, Japan, United Kingdom and the United States. The Institution also represents Singapore in the ASEAN Federation of Engineering Organizations (AFEO) and the Federation of Engineering Institutions of Asia and the Pacific (FEIAP) in promoting goodwill and fellowship among all engineers in ASEAN and the Asia-Pacific region.

Through its Engineering Accreditation Board (EAB), IES obtained full signatory status in the Washington Accord (WA) in June 2006. The entry grants IES the authority to represent Singapore, the first country within the ASEAN region which has obtained full signatory status in the WA, to vet education systems under the WA mutual recognition framework.

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Annex

IES Prestigious Engineering Achievement Awards 2018 – Citations

Category: Applied Research and Development

- **4-IN-1 Smart Utilities Plant tailored for tropics**
  By National University of Singapore (NUS) & King Abdullah University of Science and Technology

  A research breakthrough that paves the way for a more environmentally-friendly and cost-effective way of producing key essentials for daily living — electricity, potable water, air-conditioning and heat, this novel system is suitable for housing and building clusters as well as underground cities, especially those in the tropics.

  In this system, energy efficiency is optimised by maximising the cascaded recovery of waste energy that is generated. Specially designed for use in tropical countries, this 4-in-1 smart utilities plant offers greater energy and cost savings and it is also more space-efficient.

  The novel approach lowers energy usage by 25 to 30 per cent and cut carbon emission by two to four per cent for Singapore at business-as-usual levels.

- **Automated Needle Targeting with Medical Image Robotic Assisted Guidance Equipment (ANT-MIRAGE)**
  By NDR Medical Technology Pte Ltd

  NDR's smart robotic guided system: Automated Needle Targeting (ANT) is the world's first robotic system that uses Artificial Intelligence (AI) and image processing to carry out automated lesion targeting. The robotic system works well

with existing imaging modalities like C-Arm fluoroscopy, CT-scan, Ultrasound and carry out image processing using 2D images to access 3D target with precision in minimally-invasive applications like surgical puncture, lesion biopsy and tumour ablation. ANT aims to help surgeons speed up the process of accurately aligning the needle to the lesion target while minimising unnecessary radiation exposure to the surgical team.

- **Bulk photovoltaics and unique UV sensors from bulk photovoltaics**
  *By Institute of Materials Research and Engineering (IMRE), a research institute under the Agency for Science, Technology and Research (A*STAR)*

  The team has created a unique UV sensing and monitoring technology including the world's first battery-less and wireless UV monitoring system based on bulk photovoltaic in a ferroelectric thin film as the fundamentally different scientific principle. The technologies are licensed by the local enterprise and generating made-in-Singapore commercial products in the industry. The innovation comprises technical breakthroughs to provide a reliable, robust, low-cost and even energy-autonomous UV sensing and monitoring solution, with the potential to contribute significant value to the society and the industry.

- **Low Motion Semi: A next-generation revolutionary semisubmersible**
  By Keppel-NUS Corporate Laboratory

  Low Motion Semi (LMS) has the potential to become the floating solution of tomorrow given its outstanding vessel performance. The LMS is innovatively designed to offer versatility in its operations, with the ability to be adopted for drilling, production or accommodation in harsh and deepwater environments.

- **Renewable air filters from regenerating molecular building blocks**
  By NUS Faculty of Engineering

  With rising global concerns over alarming levels of particulate pollution, there is a critical need for research in sustainable air quality management, as pointed out in the United Nations' 2030 Agenda for Sustainable Development. While most research work in the field involve energy-intensive electrospun air filters, this project focuses on a simple and cost-effective way of producing high-quality air filters by coating a novel nanofibre solution on a non-woven mesh. This novel approach involves water-induced self-organisation and self-regeneration of nanofibres with high filtration efficiency and mechanical stability. After exposure

to PM 2.5 particles, the nanofibres can be easily treated and re-applied onto the mesh, hence making the air filter reusable and eco-friendly.

Category: Engineering Projects

- **National Gallery Singapore**
  By CPG Consultants Pte Ltd

  The transformation of the former Supreme Court and the City Hall building into the National Gallery is one of the largest undertaking in addition and alteration works within a National Monument.

  Adding a deep basement beneath buildings on footings require very careful planning and design, together with innovative engineering like underpinning and shoring; while key spaces like the City Hall Chamber needed to be preserved and suspended in mid-air, while the deep excavation proceeded below such spaces.

  The team was able to surmount these challenges through close collaboration and partnership. After completion, the National Gallery now houses the world's largest collection of modern South East Asian Art, thus helping to position Singapore as a regional and international hub for the visual arts.

- **Internet of Things (IoT)-enabled on-demand lighting for the Smart Nation**
  by Housing & Development Board and ST Engineering

  A collaboration between HDB and ST Engineering, the sensor-controlled smart lighting system is designed to optimise energy use in lighting common areas around HDB estates. Equipped with sensors, data collected by the system can be analysed for the following purposes:

  (i) Understand human traffic patterns to allow for predictive adjustment of light intensity according to footfall;
  (ii) Predictive maintenance to minimise disruption to residents
  (iii) Detect and alert service providers to abnormalities or malfunction

  The system has been successfully deployed in multi-storey carparks, stairwells, link-ways, common corridors and void decks of selected HDB estates. The system could potentially be extended beyond residential estates to commercial and industrial buildings.

Category: Technology Innovation

- **Soft hybrid surgical gripper for delicate tissue manipulation**
  By NUS Faculty of Engineering

  The Soft Robotic Surgical Gripper System is a low-cost, portable surgical platform that can be mounted onto any stereomicroscope to aid with delicate tissue manipulation. It comprises a pair of variable-stiffness robotic arms, each equipped with a soft hybrid gripper, and a compact fluidic control box with foot pedal controls. Preliminary findings have shown that the soft gripper system allows compliant gripping of nerve tissue with much lower compressive forces and risk of damage than conventional forceps.

Category: Young Creators Award

- **A 16-channel capacitive sensor interface circuit for physical signals monitoring**
  By NUS Faculty of Engineering

  In this project, the team has proposed and implemented a 16-channel Code Division Multiple Access (CDMA)-like multi-capacitive-sensor interface that can be deployed for multi-sensor or multi-pixel sensors. The team has demonstrated order of improvement in terms of power, data throughput and Figure-of-Merit (FoM). This work has been presented at 2018 Symposium for VLSI Technology and Circuits, which is the premier solid-state circuits conference for papers with proven silicon results.

- **Mars Science Space Rover**
  By Nanyang Polytechnic (NYP)

  Mars has always been a source of inspiration for explorers and scientists. Robotic missions have found evidence of water, but it is still a mystery if life exists beyond Earth. Robotic and scientific robotic missions have shown that Mars has characteristics and a history similar to the Earth's, but there are striking differences that mankind has yet to begin to understand. The Mars Science (MS) Space Rover is a prototype built in NYP that could certainly help explore and understand about the Red Planet.