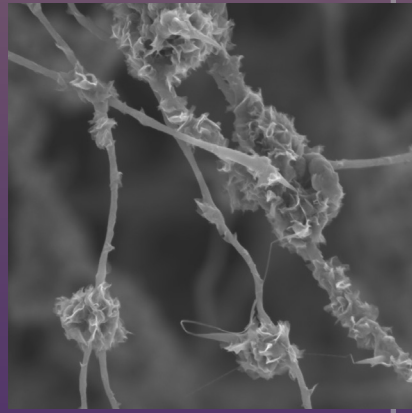
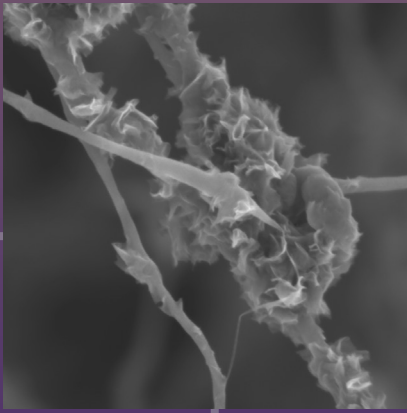
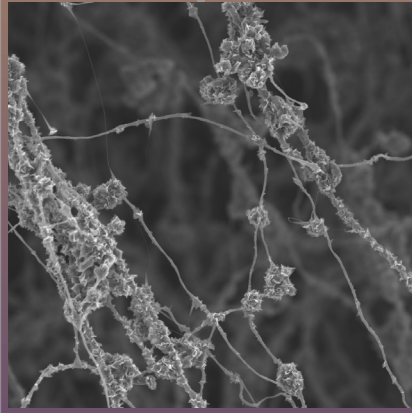
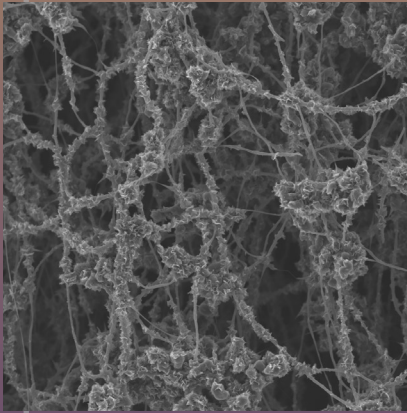




Institute of Nanoscience and Nanotechnology



NanoSights

2025
ANNUAL MAGAZINE

PREFACE

It is my privilege to present NanoSights 2025, the 12th edition of our annual magazine.

NanoSights serves as a lens through which we reflect on our growth, achievements, and the people who shape our shared journey.

Within these pages, you will find highlights from 2025, including our institute's performance and governance, research excellence, collaborative ventures, talent development, as well as the strategic and supporting activities that collectively drive us forward. Each milestone reflects not only individual dedication but also the collective synergy that defines our institute.

We extend our sincere appreciation to all contributors, editors, and supporters who have made this publication possible.

We invite you to explore this edition as we celebrate our achievements and look forward to future opportunities.

By the Chief-in-Editor

Assoc. Prof. Ir. Ts. Dr. Siti Hajar Othman

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Image obtained using Field Emission Scanning Electron Microscope (FESEM)
Sample: Graphenated Carbon Nanotubes (g-CNTs)
Source: Dr. Ismayadi Ismail

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Bismillahirrahmanirrahim.

It is with great pleasure that I present this message in this year's edition of NanoSights, our annual institute magazine reflecting the journey and growth of the Institute of Nanoscience and Nanotechnology (ION2), UPM.

Throughout the year, ION2 continues to advance as a dynamic research institute driven by excellence, innovation, and collaboration. Our researchers have received notable recognition, including the Malaysia Research Star Award 2025, the Excellence in Research Innovation Award (STEM Category) at MSRSA 2025, and the Luminary Award at MYIIC 2025, reflecting the strength and quality of our research culture.

We have also strengthened our international collaborations through the RM1,182,276.00 Malaysia-Thailand Joint Authority (MTJA) research grant and active engagements with universities and industries in Türkiye, Indonesia, and Japan.

We are honoured to be named Best Institute/Academy of the Year 2024 at the Industry and Community Appreciation Ceremony (ICAN 2025), reflecting our commitment to impactful engagement with industry and the wider community.

This year, we continue our commitment to community engagement through the NanoDidik initiative. As part of NanoDidik @Negeri Sembilan 2025, in collaboration with MOSTI, NNC, and JPNS, we supported SEMESRA students in strengthening their understanding of nanoscience, contributing to their success at the 1st International Nanotechnology Olympiad for High School (INOHS2025). We also engaged over 500 students and educators from across Selangor through STI MADANI: NanoDidik @UPM, bringing hands-on science experiences to the community.

A MESSAGE *from the* DIRECTOR



I would like to express my sincere appreciation to all staff, researchers, and partners for their dedication and contributions throughout the year. ION2 will continue to build on its achievements in excellence, innovation, and impact.

**PROF. IR. TS.
DR. SURAYA ABDUL RASHID**



FINANCIAL SUPPORT

RM1.5 Million

Research grants

RM245,000

Yearly endowment growth

RM9.4 Million

High-end equipment



OUR TEAM

66

Researchers from multiple fields

14

Researchers listed in World Top 2% Scientists



RESEARCH INSIGHTS

101

Q1 & Q2 journals

134

Scopus-indexed journals

GRADUATE MILESTONES

4 Master's graduates

10 PhD graduates



COLLABORATIVE NETWORK

17 Active MoU/MoA to date



ION2 2025 KEY INSIGHTS

OVERVIEW

The Institute of Nanoscience and Nanotechnology (ION2), formerly known as the Institute of Advanced Technology (ITMA), is a premier research institute at Universiti Putra Malaysia (UPM), established in November 1999. On 1 November 2021, the institute embarked on a transformative journey by re-branding itself as ION2. This strategic move was to enhance visibility, sharpen its focus, and strengthen its positioning as a national and regional leader in nanoscience and nanotechnology.

ION2 aspires to become a leading centre of excellence in nanotechnology and advanced materials, with an emphasis on niche areas such as nanoscale green synthesis and its real-world applications. The institute also explores emerging frontiers across the broader discipline of nanoscience.

The institute brings together researchers of international repute to lead three dedicated research laboratories, driving impactful research aligned with national priorities and global challenges. ION2 actively contributes to the scientific community through high-impact publications, organization of conferences, workshops, and seminars, and a strong commitment to innovation and intellectual property creation.

MISSION

To contribute significantly towards wealth creation, nation-building, and universal human development through high-impact research in nanotechnology and advanced materials.

VISION

To become a research institute of international repute in the field of nanotechnology and advanced materials.

GOALS

- To empower the institute as a premier centre of excellence by providing the best research infrastructures.
- To elevate scientific achievements in research and innovation to international levels.
- To produce knowledgeable and competitive graduates.
- To strengthen involvement of relevant industry and community towards wealth creation and knowledge sharing.
- To strengthen institutional governance, financial and green practices sustainability



ACHIEVEMENTS

& AWARDS

This section showcases the institute's dedication to research excellence, highlighted by successful funding, high-impact publications, and outstanding researcher achievements. Through groundbreaking discoveries and innovation, the institute continues to push the boundaries of nanoscience and nanotechnology.

NEW GRANTED RESEARCH GRANTS

Project title	Details
Integrated Approach for Mitigating Salt Precipitation and Fines Migration in CO ₂ Injection: Reservoir-Scale Assessment and Chemical Inhibition Strategies	Amount: RM1,182,276.00 Funder: Malaysia-Thailand Joint Authority (MTJA) Researcher: Assoc. Prof. Dr. Shahrul Ainliah Alang Ahmad
Optimizing Nickel-Copper-Based Electrocatalysts for Scalable Hydrogen Water Splitting	Amount: RM100,000.00 Funder: UPM Researcher: Assoc. Prof. Dr. Suriati Paiman
CNT-Ferrite Nanohybrid Synthesized via Chemical Vapour Deposition for Enhanced Antenna with Emi Shielding Application	Amount: RM40,000.00 Funder: UPM Researcher: Ts. Dr. Intan Helina Hasan
Development of a Non-Live Feed Incorporating Solid Lipid Nanoparticles as a Lipid Source for Larviculture of Pangasius Hypophthalmus	Amount: RM20,000.00 Funder: UPM Researcher: Assoc. Prof. Dr. Mas Jaffri Masarudin
Development of Carbon Quantum Dot-based Bionanocomposite Films for Active Food Packaging Applications	Amount: RM146,800.00 Funder: UPM Researcher: Assoc. Prof. Ir. Ts. Dr. Siti Hajar Othman

Nanoscale

PAPER

[Check for updates](#)

DOI: 10.1039/D3NR01001A

Advanced flexible supercapacitors: vertical 2D MoS₂ and WS₂ nanowalls on graphenated carbon nanotube cotton†

Ulfa Paripatny, ¹ Eza Kasaz Perparan², Zuliyha Khatib,^{3,4} Durgam Lakshmi ⁵ Anurag Khandelwal⁶ and Ernie Gun¹

Flexible supercapacitors (SCs) which are energy produced from carbon-based materials, are emerging choices for lightweight, portable, miniaturized, and reusable electronic products. However, it is important to improve the energy density, power density and durability of flexible SCs for which novel developed materials and constructs are required. In this study, we developed flexible SCs with enhanced capacitance and stability using the advantages of top-down fabricated sets of vertical two-dimensional MoS₂ and WS₂ nanowalls. Electrodes were grown on graphenated carbon nanotube (G-CNT) cotton using Radio Frequency (RF) magnetron sputtering to create energy storage to investigate the rapid and vertical device fabrication for the performance of the as-deposited SCs. Capacitance Charge Discharge (CCD) measurement revealed a maximum area capacitance value of 133.46 mF cm⁻² for the best MoS₂ electrode and a value of 193.02 mF cm⁻² for the best WS₂ electrode. The flexibility of the SCs was also confirmed by energy-dispersive X-ray measurement, which revealed almost no change in X-ray peaks for 10000 cycles of mechanical bending and 10000 cycles of stretching. The electrochemical stability of the device at constant high current/voltage rates, and porosity of G-CNTs with the unique feature of nanotube walls (nanotubes) to develop SCs with improved efficiency and flexibility.

1. Introduction

Today, electrochemical energy-storage systems are the most popular form of energy storage for use in a variety of applications such as cell phones, personal computers, backup power sources and electric or hybrid vehicles. Batteries, capacitors and supercapacitors (SCs) are the main devices in this category that store energy through chemical reactions, conventional ion adsorbent batteries are commonly employed for long-term energy storage in backup applications. They offer a relatively high energy density but are limited by their low power density, usually below 1.0W kg⁻¹. Alternatively, SCs offer a higher power density with lower energy density owing to their fast charge/discharge characteristics. The distinction between these two devices makes them suitable for diverse applications with different performance parameters.¹⁻⁴ For instance, the fast charge and discharge characteristics of SCs is suitable for SC power energy harvesting (especially for transient and energy-conversion applications), energy storage and reuse, and energy-conversion applications.^{5,6}

The energy-storage mechanisms of SCs basically through two primary processes: charge accumulation, which is typical characteristics of electric double-layer capacitors (EDLCs), and irreversible redox reactions, which are characteristics of pseudo-capacitors.⁷ In EDLCs, the capacitance mainly arises from the accumulation of charge at the electrode/electrolyte interface. Consequently, the electrochemical performance of these capacitors is significantly affected by factors such as the pore size and distribution, wettability, and the specific surface area of the electrode materials. These structural parameters of electrode materials are critical for the electrochemical performance of EDLC devices.⁸ Carbonaceous materials have been widely used as electrodes for EDLCs because of their high surface areas, excellent electrochemical reversibility, and straightforward synthesis processes.⁹ Furthermore, since no faradaic reactions are involved in

ROYAL SOCIETY OF CHEMISTRY

View Article Online
DOI: 10.1039/D3NR01001A

Key Performance Index (KPI)

Achievements

Publications in CIJ 134

Publications in Q1 & Q2 Journals 101 (75.3%)

Chapter in Research Books 2

Other Publications 10

PUBLICATIONS

Key Performance Index (KPI)	Achievements
Publications in CIJ	134
Publications in Q1 & Q2 Journals	101 (75.3%)
Chapter in Research Books	2
Other Publications	10

NanoSights 2025 | 03

Most-Cited Scientists in Their Respective Fields (Single Year 2025)
by Elsevier BV, Stanford University



Ts. Dr. Umer Rashid
(2,005 citations)



Prof. ChM
Dr. Lim Hong Ngee
(1,661 citations)



Assoc. Prof.
Dr. Khamirul Amin Matori
(1,195 citations)



Prof. Dr. Mohd Adzir Mahdi
(1,190 citations)



Dr. Mohd Hafiz
Mohd Zaid
(1,181 citations)



Prof. Dr.
Rosfarizan Mohamad
(1,041 citations)



Prof. ChM
Dr. Zulkarnain Zainal
(952 citations)



Prof. ChM
Dr. Nor Azah Yusof
(911 citations)



Assoc. Prof. ChM Dr.
Yusran Sulaiman
(694 citations)



Assoc. Prof. Dr. Mohamad
Amran Mohd Salleh
(690 citations)



Assoc. Prof.
Dr. Abdul Halim Abdullah
(639 citations)



Assoc. Prof.
Dr. Yap Wing Fen
(617 citations)



Assoc. Prof. Dr. Nur Hanani
Zainal Abedin
(639 citations)



Assoc. Prof. Dr. Noorjahan Banu
Mohammed Alitheen
(617 citations)

Most-Cited Scientists in Their Respective Fields (Career 2025)
by Elsevier BV, Stanford University



Ts. Dr. Umer Rashid
(2,005 citations)



Prof. ChM
Dr. Lim Hong Ngee
(1,661 citations)



Prof. Dr. Mohd Adzir Mahdi
(1,190 citations)



Prof. ChM
Dr. Zulkarnain Zainal
(952 citations)



Prof. ChM
Dr. Nor Azah Yusof
(911 citations)



Assoc. Prof. Dr. Mohamad
Amran Mohd Salleh
(690 citations)



Assoc. Prof. Dr. Nur Hanani
Zainal Abedin
(639 citations)



Assoc. Prof. Dr. Noorjahan Banu
Mohammed Alitheen
(617 citations)

"A researcher's greatest success is not measured by the accolades received, but by the doors of knowledge they open for the generations that follow. Dedication is the key that unlocks those doors."



Congratulations



Assoc. Prof. Dr. Yap Wing Fen received the Malaysia Research Star Award 2025 under the "Researcher Cluster" category, which included a trophy, a certificate of appreciation, and a cash prize of RM1,000.



Prof. Ir. Ts. Dr. Suraya Abdul Rashid was awarded the Excellence in Research Innovation Award (STEM Category) at the Malaysia Scopus Research Star Awards (MSRSA) 2025.



Prof. Ir. Ts. Dr. Suraya Abdul Rashid received the Luminary Award at the Malaysia Invention & Innovation Convention (MYIIC) 2025.

ION2 and its partners were honoured with several awards at the Industry and Community Appreciation Ceremony (ICAN 2025), in recognition of their contributions to industry and community engagement.



The Best Industry Partner Award was presented to the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME) in recognition of their active collaboration with Assoc. Prof. Dr. Che Azurahaman Che Abdullah, who accepted the award on the organisation's behalf.



Best Community Partner Award presented to Sekolah Menengah Kebangsaan Kajang Utama (SMK Kajang Utama) through the KTGS@ION2 project, led by Assoc. Prof. Dr. Norizah Abdul Rahman.

Congratulations to the following researchers who were honoured with the Vice Chancellor Fellowship Award (Research and Innovation) during the prestigious Majlis Gemilang Putra 2025, held on 23 May 2025:



Prof. Ir. Ts. Dr. Suraya Abdul Rashid
Innovation and Product
Commercialisation Category
– Science and Technology



Assoc. Prof. Dr. Nur Syakina Jamali
Young Researcher Category
– Science and Technology

Great researchers do more than seek answers—they ask the questions that move the world forward.

ION2 recognised outstanding researchers during the Researcher and Student Appreciation Ceremony, held on 1 December 2025, to honour exceptional graduates and acknowledge the valuable contributions of researchers throughout 2024.

Researcher Excellence Awards 2024 were presented to the following recipients:



**ASSOC. PROF. DR.
KHAMIRUL AMIN MATORI**

Nanomaterials Synthesis and
Characterisation Laboratory (NSCL)



**ASSOC. PROF. CHM DR.
YUSRAN SULAIMAN**

Functional Nanotechnology Devices
Laboratory (FNDL)



**ASSOC. PROF. DR. CHE AZURHANIM
CHE ABDULLAH**

Nanomaterials Synthesis and
Characterisation Laboratory (NSCL)

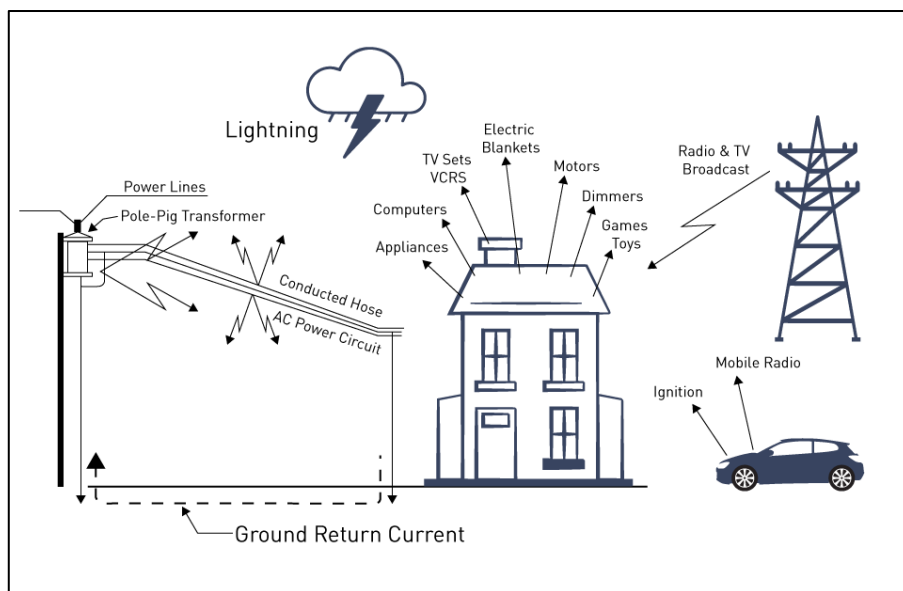
RESEARCH Highlights



Forget Metal Shields: This New "Sponge" for Electronic Noise Changes Everything

Dr. Ismayadi Ismail
ismayadi@upm.edu.my

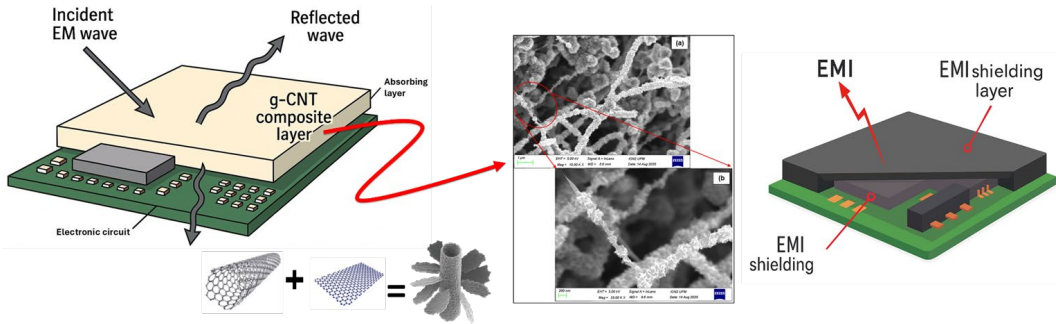
If you have ever been sitting near a speaker when a mobile phone starts to ring, you have already met electromagnetic interference, or EMI, in its most harmless form. That brief crackle, the little stutter of sound before the call connects, is actually a small clue to a far bigger puzzle that engineers wrestle with all the time. We now live in a world absolutely drenched in signals. Smartphones talking to towers, cars talking to satellites, smart watches talking to fridges, and 5G racing toward 6G, all of it crammed together in a space so crowded that signals sometimes wander where they do not belong. When that happens, sensitive electronics can stumble. A reading flickers. A connection drops. A circuit misbehaves. And in the background, companies pour time and money into fixing something you cannot even see, often by wrapping devices in heavy metal shields that add weight, cost, and stiffness to designs that really need to be light and flexible.



Sources and coupling paths of electromagnetic interference (EMI) in a residential environment.

For a long time, metal was really the only answer. It worked, but it also came with compromises. Metal adds heft. It does not bend easily. It can rust or corrode. And in environments where every gram matters, like aerospace or electric vehicles, it can become a burden rather than a solution. So, researchers have been asking for years whether there might be another way, something that could do the same job but without the trade-offs.

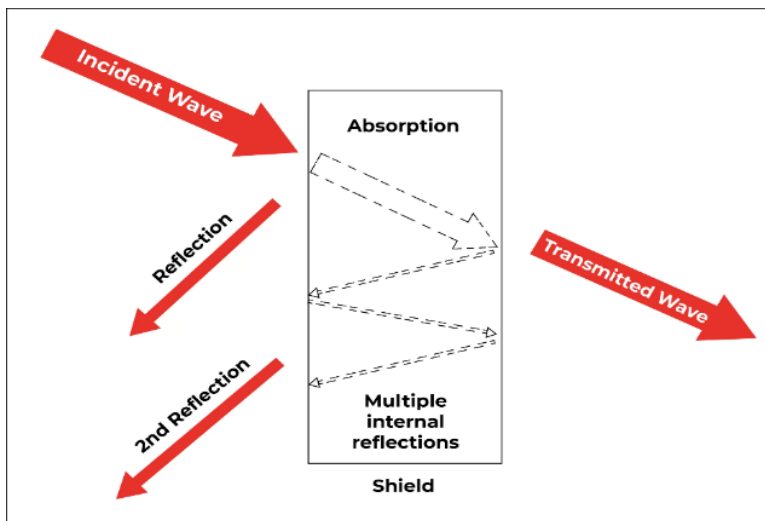
At Universiti Putra Malaysia, a team of scientists has been working on an answer that comes not from metal but from carbon, though not the carbon you might remember from pencil lead or charcoal. They have engineered something called graphenated carbon nanotubes, or g-CNTs, which is really just a technical way of saying they have grown tiny carbon structures that look like microscopic trees covered in leaves. The trunk is a carbon nanotube, thin and highly conductive. The leaves are graphene-like flakes, also conductive, bonded directly onto the tube. The result is a single, unified material with an enormous amount of surface area packed into a tiny space.



g-CNT composite EMI shielding concept and microstructure. Schematic shows an incident EM wave being reflected and absorbed by a g-CNT composite layer on an electronic circuit, supported by SEM images of the conductive g-CNT network and an illustration of the resulting EMI shielding layer.

Now, why does that matter for blocking electromagnetic noise? To understand that, it helps to know how engineers measure shielding. They use something called shielding effectiveness, measured in decibels. In everyday language, a material that hits about 20 decibels is doing a decent job for most consumer electronics. Push that to 30 or 40, and you are talking about military or aerospace standards. But there is another layer to the story. A shield can work in two very different ways. It can act like a mirror, bouncing the waves away. Or it can act like a sponge, soaking them up and turning them into tiny, undetectable amounts of heat. Bouncing sounds good at first, but it can also send interference ricocheting around a device, causing problems somewhere else. Soaking, on the other hand, quietly eliminates the energy.

The g-CNT approach leans hard into absorption. Because of that leafy, tree-like structure, electromagnetic waves that enter the material find themselves bouncing around inside, losing energy as they go. The nanotubes give electrons a clear path to travel. The graphene flakes create interfaces where energy gets trapped and dissipated. It is a kind of microscopic maze that waves enter but struggle to leave.



EMI shielding mechanism by reflection, absorption, and internal multiple reflections. An incident wave is partially reflected at the surface, attenuated within the shield, and the remaining portion is transmitted after repeated internal reflections.

What makes this practical is that g-CNTs are not meant to replace the materials we already use. They are designed to be added to them. Mix a small amount into silicone, rubber, epoxy, or paint, and suddenly those ordinary materials take on a new ability. You can spread them as thin coatings, mold them into flexible sheets, or seal gaps with them. In the lab, the team tested a silicone composite loaded with thirty percent g-CNT. At just one millimeter thick, it already blocked about forty decibels of interference. At two millimeters, that jumped to sixty. At three millimeters, it hit around eighty, a level of performance that is genuinely striking for a material that is still mostly silicone. And throughout those tests, absorption stayed firmly in charge. The material was not just pushing noise away. It was quietly swallowing it.

There is also room to tweak the recipe. By adding magnetic particles like barium hexaferrite, the team found they could shape how the material behaves, making it useful in different frequency ranges or environments. The absorption stayed strong, even as the frequency shifted.

So where does something like this go next? Electromagnetic noise is not going to get better. If anything, the world is only getting louder. Electric vehicles pack high-voltage systems into tight spaces. Telecommunications hardware pushes more data through narrower channels. Wearable devices sit against skin and talk constantly to phones and networks. All of that creates a growing need for shields that are thin, light, flexible, and effective. And g-CNT composites seem to check those boxes in a way that metal often cannot.

Behind this work is Dr. Ismayadi Ismail at the Institute of Nanoscience and Nanotechnology, part of steady effort in Malaysia to build advanced materials that can hold their own in global markets. It is not just about lab numbers, though the numbers are impressive. It is about rethinking how we protect the electronics that run our lives, moving away from brute force and toward something more elegant. A shield that bends, that blends in, that absorbs rather than deflects. If it scales up, if it finds its way into supply chains and manufacturing lines, it could help make the next generation of devices not just smaller and lighter, but also quieter inside, free from the crackle of signals stepping where they do not belong.

This work is led by Dr. Ismayadi Ismail at the Institute of Nanoscience and Nanotechnology at Universiti Putra Malaysia. But beyond the technical achievements, there's a larger story here about Malaysia building deep-tech materials capable of holding their own in global supply chains while solving a problem that affects nearly every modern electronic device. If efforts to scale up production and secure certifications move forward successfully, g-CNT based shielding could one day offer a practical path to electromagnetic protection that is thinner, lighter, more adaptable, and far more focused on absorption. And in a world that keeps getting noisier, that could help our electronics run more quietly and reliably, no matter how crowded the signals become.

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RESEARCH Highlights



Seed Nano-priming with Calcium Silicate Nanoparticles (CaSiO₃NPs): A Reliable Approach to Enhance Germination and Early Seedling Growth in Iraqi Rice under Drought Stress

Assoc. Prof Dr. Rosimah Nulit
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Rice (*Oryza sativa* L.) is a staple food crop consumed by more than half of the world's population, particularly in Asia and Africa. Major crops such as rice, wheat, and maize are frequently exposed to abiotic stresses including drought, heat, cold, salinity, and heavy metals, which severely reduce plant growth, yield, and overall productivity, thereby threatening food security, economic stability, and ecosystem sustainability (Ahmad et al., 2023; Wang and Ren, 2025). Among these stresses, drought is one of the most destructive, impairing plant metabolism and physiological processes and causing yield losses ranging from 30% to 90%, depending on species and developmental stage.

Drought stress during germination and early seedling stages is particularly detrimental in rice, as it delays and disrupts uniform seedling establishment. This results in uneven growth, delayed panicle initiation, and ultimately reduced grain yield. Seed priming has emerged as a simple, cost-effective, and widely adopted pre-sowing strategy to enhance germination performance, promote uniform seedling emergence, improve seedling vigor, and increase yield under adverse environmental conditions such as drought, salinity, and biotic stresses (Kunwar et al., 2025).

In the present study, calcium silicate nanoparticles (CaSiO₃NPs) were applied as a seed nano-priming agent to improve germination and early seedling growth in three Iraqi rice genotypes ('Amber', 'Furat', and 'Yasmine') under drought stress. Seeds of each genotype were primed with CaSiO₃NPs at concentrations of 0.01%, 0.02%, 0.03%, and 0.05%, along with a non-primed control.

CaSiO₃NPs seed priming significantly enhanced germination attributes and early seedling growth under drought conditions compared with non-primed seeds. Germination performance, measured by germination percentage (GP) and germination index (GI), was improved as presented in Table 1. 'Furat' recorded the highest GP (90%) and GI (9.35–9.05) at 0.03–0.05%, compared with the control (GP: 63.2%; GI: 5.93). Early seedling growth parameters, including shoot length (SHL), root length (RL), and total seedling length (SL), were also significantly increased as tabulated in Table 2. Shoot length in 'Furat' more than doubled (8.78–9.08 cm) at 0.02–0.03% relative to the control (3.82 cm). At 0.02% CaSiO₃NPs, 'Yasmine' exhibited the greatest root length (8.68 cm) and total seedling length (18.79 cm), compared with the control (1.92 cm and 11.24 cm, respectively). Seed vigor was highest in 'Furat' at 0.03%, showing a 2.6-fold increase compared to the control (12.0 vs. 4.6).



Table 1. Effects of seed priming with calcium silicate nanoparticles (CaSiO₃NPs) on the germination attributes of three Iraqi rice genotypes under drought stress.

Rice genotype	Priming treatment	GP (%)	GI	MGT(Days)
Amber	Control	80.00 ± 6.15 ^{abc}	7.60 ± 0.24 ^{abc}	9.00 ± 0.00^a
Furat	Control	63.20 ± 6.21 ^{bc}	5.93 ± 0.27 ^c	8.91 ± 0.075^a
Yasmine	Control	76.67 ± 11.30 ^{abc}	6.63 ± 0.70 ^{bcd}	8.93 ± 0.12^{ab}
Amber	0.01%CaSiO ₃ -NPs	93.20 ± 4.16 ^a	10.60 ± 0.75 ^a	8.00 ± 0.00^b
Amber	0.02%CaSiO ₃ -NPs	83.20 ± 9.13 ^{ab}	8.20 ± 1.16 ^{abc}	8.60 ± 0.40^{ab}
Amber	0.03%CaSiO ₃ -NPs	73.40 ± 2.51 ^{abcd}	7.20 ± 1.02 ^{bc}	8.40 ± 0.24^{ab}
Amber	0.05%CaSiO ₃ -NPs	50.00 ± 11.74 ^{bc}	5.20 ± 1.24 ^c	8.40 ± 0.24^{ab}
Furat	0.01%CaSiO ₃ -NPs	86.66 ± 6.23 ^{ab}	8.04 ± 0.60 ^{abc}	8.81 ± 0.11^a
Furat	0.02%CaSiO ₃ -NPs	80.00 ± 9.72 ^{abc}	7.75 ± 1.12 ^{abc}	8.75 ± 0.13^a
Furat	0.03%CaSiO ₃ -NPs	90.00 ± 6.67 ^a	9.35 ± 0.70 ^a	8.57 ± 0.08^a
Furat	0.05%CaSiO ₃ -NPs	90.00 ± 6.66 ^a	9.09 ± 0.71 ^{ab}	8.63 ± 0.13^a
Yasmine	0.01%CaSiO ₃ -NPs	60.00 ± 8.49 ^{bc}	4.79 ± 0.64 ^d	9.19 ± 0.19^a
Yasmine	0.02%CaSiO ₃ -NPs	96.66 ± 3.33 ^a	11.42 ± 0.83 ^a	8.31 ± 0.10^b
Yasmine	0.03%CaSiO ₃ -NPs	50.00 ± 5.27 ^c	5.07 ± 0.63 ^d	8.65 ± 0.15^{ab}
Yasmine	0.05%CaSiO ₃ -NPs	60.00 ± 10.00 ^{bc}	5.29 ± 0.99 ^d	9.00 ± 0.23^{ab}

Table 2. Effects of seed priming with CaSiO₃-NPs on the early seedling growth of three Iraqi rice genotypes under drought stress.


Rice genotype	Priming treatments	SHL (cm)	RL (cm)	SL (cm)	SV
Amber	Control	6.84 ± 0.32 ^d	1.76 ± 0.02 ^d	10.88 ± 0.95 ^{bc}	7.20 ± 0.49^{bcd}
Furat	Control	3.82 ± 0.315 ^d	2.78 ± 0.04 ^c	13.42 ± 0.39 ^a	4.60 ± 0.67^e
Yasmine	Control	6.66 ± 0.22 ^c	1.92 ± 0.05 ^b	11.24 ± 0.97 ^{bc}	6.40 ± 0.98^d
Amber	0.01% CaSiO ₃ -NPs	9.78 ± 0.47 ^{bcd}	2.46 ± 0.25 ^{bcd}	12.83 ± 1.20 ^{bc}	11.40 ± 0.51^a
Amber	0.02% CaSiO ₃ -NPs	10.12 ± 1.03 ^{abcd}	2.72 ± 0.24 ^{bcd}	12.31 ± 2.00 ^{bc}	10.60 ± 1.29^{abc}
Amber	0.03%CaSiO ₃ -NPs	9.18 ± 1.32 ^{bcd}	3.18 ± 0.69 ^{ab}	12.72 ± 1.79 ^{bc}	9.20 ± 2.03^{abcd}
Amber	0.05%CaSiO ₃ -NPs	9.66 ± 1.75 ^{bcd}	3.08 ± 0.24 ^{abc}	13.18 ± 1.91 ^b	5.60 ± 0.98^d
Furat	0.01% CaSiO ₃ -NPs	6.42 ± 0.36 ^{abc}	4.54 ± 0.43 ^{ab}	12.76 ± 1.02 ^a	9.40 ± 0.75^{abcd}
Furat	0.02% CaSiO ₃ -NPs	8.78 ± 0.73 ^{ab}	3.98 ± 0.44 ^{abc}	13.32 ± 0.90 ^a	10.40 ± 1.50^{abc}
Furat	0.03%CaSiO ₃ -NPs	9.08 ± 0.71 ^a	4.24 ± 0.36 ^{abc}	12.14 ± 0.91 ^a	12.00 ± 0.95^{ab}
Furat	0.05%CaSiO ₃ -NPs	7.90 ± 0.87 ^{abc}	4.24 ± 0.25 ^{abc}	11.89 ± 1.64 ^a	11.20 ± 1.32^{ab}
Yasmine	0.01% CaSiO ₃ -NPs	9.06 ± 0.89 ^{abc}	3.96 ± 0.52 ^b	14.25 ± 0.28 ^{ab}	7.40 ± 0.75^{bcd}
Yasmine	0.02% CaSiO ₃ -NPs	9.94 ± 0.39 ^a	4.32 ± 0.29 ^b	18.79 ± 4.87 ^a	13.60 ± 0.51^a
Yasmine	0.03%CaSiO ₃ -NPs	10.14 ± 0.94 ^a	8.68 ± 4.37 ^a	13.99 ± 0.88 ^{abc}	9.20 ± 2.49^{bcd}
Yasmine	0.05%CaSiO ₃ -NPs	9.90 ± 0.79 ^a	4.10 ± 0.33 ^b	12.36 ± 0.69 ^{bc}	8.40 ± 1.25^{bcd}

The enhancement in germination and seedling performance may be attributed to improved hydration regulation during seed priming, which activates pre-germination metabolic processes such as controlled water imbibition, enhanced electron transfer, and increased cellular surface reactivity. These mechanisms accelerate hydrolytic enzyme activation, stimulate cell division, and promote early seedling development (Ali et al., 2020; Janah et al., 2025). Moreover, the nanoscale size of CaSiO_3 NPs likely facilitates efficient penetration into seed tissues, improving water balance regulation and accelerating metabolic activation.

In conclusion, seed nano-priming with CaSiO_3 NPs effectively enhanced germination and early seedling growth in three Iraqi rice genotypes under drought stress. This approach demonstrates strong potential as a practical, scalable, and sustainable strategy to improve rice performance under water-stress condition.

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- [4] Kunwar, U.B., Wen, J., Subedi, R., Bist, N.S., Pandit, N.R. 2025. Adaptations of rice seed germination to drought and hypoxic conditions: Molecular and physiological insights. *Seeds* 3:656–676.
- [5] Wang, L., Ren, W. 2025. Drought in agriculture and climate-smart mitigation strategies. *Cell Reports Sustainability* 2:100386.



“Research is the bridge between today’s challenges and tomorrow’s sustainable solutions—where every discovery plants a seed for a better world.”

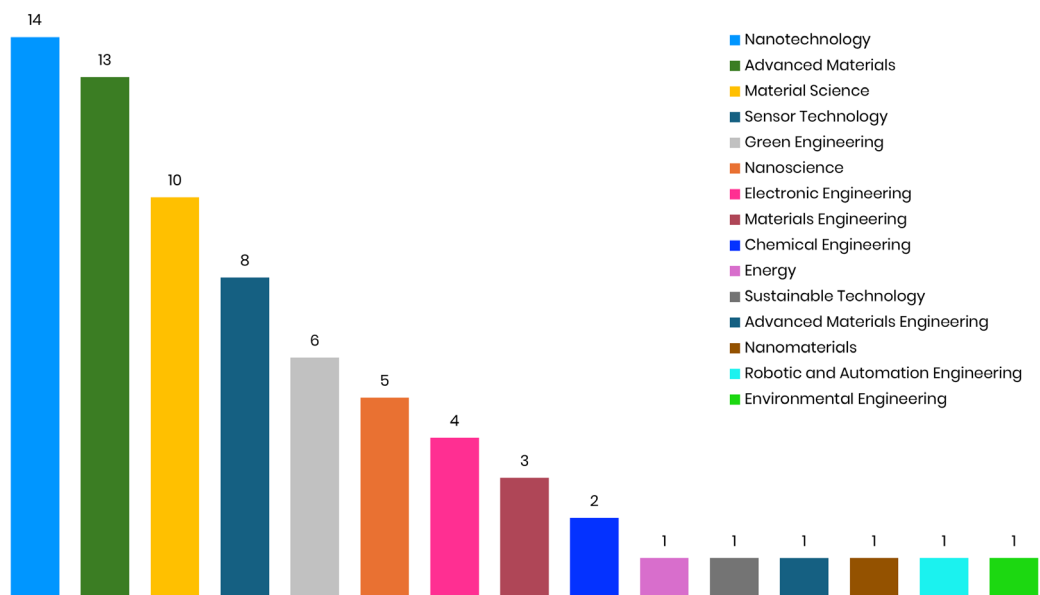


POSTGRADUATES

71

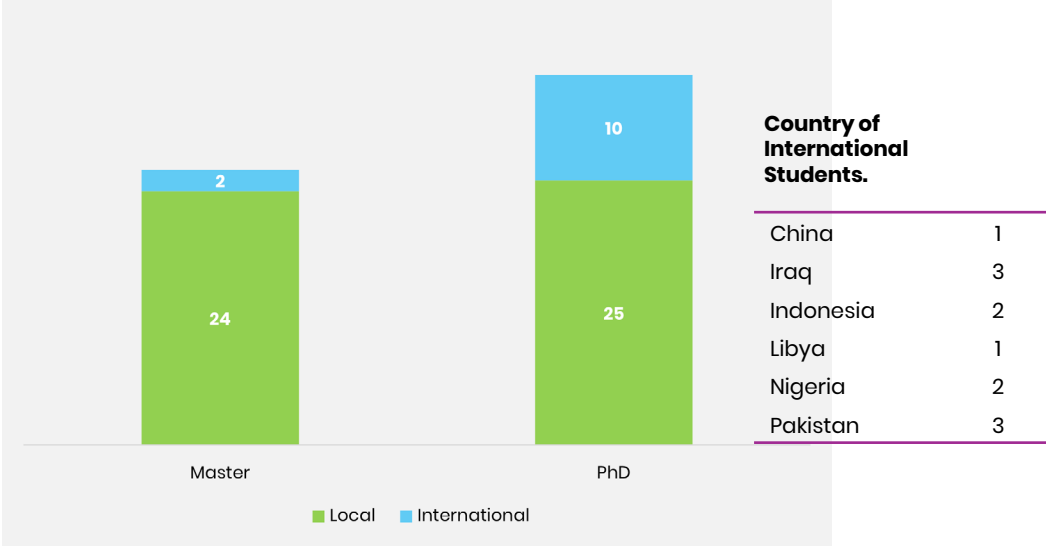
From 2021 to 2025, ION2 produced a total of 71 graduates, including six Doctor of Philosophy (PhD) graduates and five Master's degree graduates in 2025.

Distribution of ION2 Graduates by Field of Study (2021–2025)

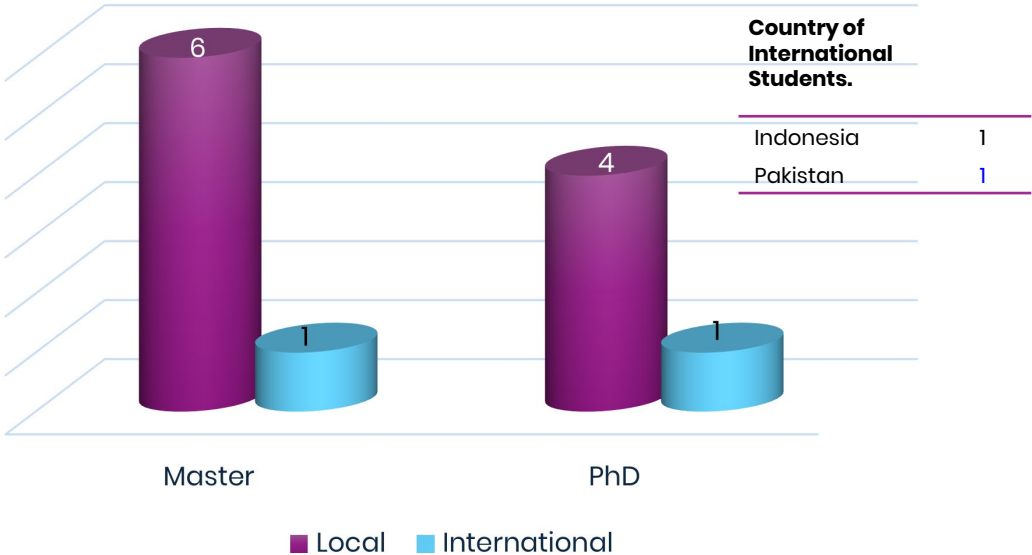


In 2025, total enrolment was 61 students, consisting of 35 PhD and 26 Master's candidates. This figure included 12 international students from various countries. Additionally, 12 new students were admitted during the year.

STUDENT ENROLMENT



STUDENT ADMISSION





Honouring the ION2 Class of 2025!



PhD

MOHD RUZAIMI BIN MOHD ARIFFIN

Supervisor: Suhaidi bin Shafie

Field of Study: Green Engineering

Thesis: Efficiency Enhancement of a Hybrid Photovoltaic-thermoelectric Generator Greenhouse System Based on Temperature Distribution.



PhD

EMMELLIE LAURA ALBERT

Supervisor: Che Azurahanim binti Che Abdullah

Field of Study: Nanotechnology

Thesis: Biogenic Synthesis of Reduced Graphene Oxide, Iron Oxide, and Their Nanocomposites for Magnetic Hyperthermia Therapy Applications.



PhD

DU XUAN

Supervisor: Suraya binti Abdul Rashid

Field of Study: Environmental Engineering

Thesis: Electrospun Cellulose Acetate and Chitosan Composite Membranes for Efficient Sorption of Heavy Metals from Aqueous Solutions.



PhD

BABANI SULEIMAN

Supervisor: Mohd Nizar bin Hamidon

Field of Study: Advanced Materials

Thesis: Prosopis Africana Carbon Char-based Thick-film Conductors with Linseed Oil Binder for Flexible X-band Antenna Applications in Sustainable Electronics.



PhD

MUHAMMAD ALIYU

Supervisor: Umer Rashid

Field of Study: Advanced Materials

Thesis: Heterogeneous Hydrochar-based Catalyst Development from Waste Palm Leaves for Biodiesel Production from Nonedible Oils.



PhD

HUSSEIN ABDULSALAM ALI

Supervisor: Suhaidi bin Shafie

Field of Study: Electronic Engineering

Thesis: Bifacial Dye-sensitized Solar Cells through Stack Formation Framework and Graphene Doping in Photoanode for Highly Efficient Energy Harvesting.



MASTER

ASHREEN NORMAN

Supervisor: Che Azurahanim binti Che Abdullah

Field of Study: Nanoscience

Thesis: Etlingera Elatior Extract-mediated Green Synthesis, Characterization, Photocatalytic Performance, and Toxicity Evaluation of Titanium Dioxide Nanoparticles.



MASTER

TAN KHAI YANG

Supervisor: Lim Hong Ngee

Field of Study: Materials Science

Thesis: Resin Formulation Based on Freeze-dried Silver Nanowire for Vat Photopolymerization 3d Printing of Stretchable and Electrically Conductive Nanocomposites.



MASTER

NURUL AIN HUZAIFAH BINTI MOHD NORIZAN

Supervisor: Nordin bin Hj Sabli

Field of Study: Materials Science

Thesis: Role of Centrifugation and Annealing in Enhancing Nitrogen Doped Graphene Synthesised by Ball Milling for Efficient Oxygen Reduction Reaction.



MASTER

NUR AFIF NADHRAH KAMARUZAMAN

Supervisor: Suraya binti Abdul Rashid

Field of Study: Nanotechnology

Thesis: Hydrothermal Synthesis and Characterisation of Red-shifted Carbon Quantum Dots from Biochar for Determination of Ferric Ions.

2024 OUTSTANDING STUDENT AWARD

Dr. Sani Yusuf

Supervisor:

Assoc. Prof. Dr. Raba'ah Syahidah Azis



GRADUATE-ON-TIME

Dr. Muhammad Aliyu (5 Semester)

Supervisor:

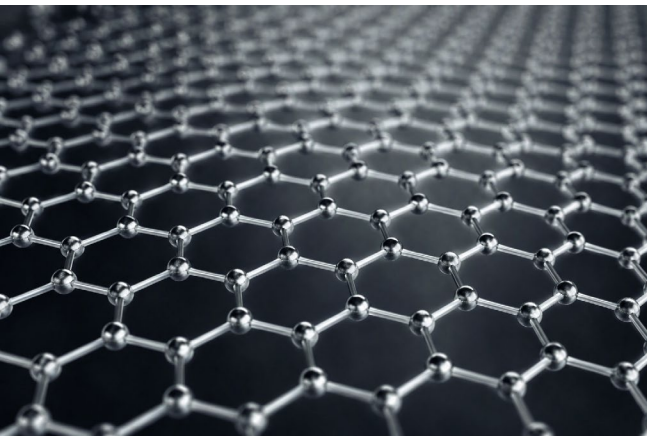
Ts. Dr. Umer Rashid



Cherished moments from "Majlis Apresiasi Penyelidik dan Pelajar 2025".
1 December 2025

FIELDS OF STUDY

At ION2, students have the opportunity to delve into cutting-edge fields of study through six specialised programmes. Designed to cultivate expertise in nanoscience and nanotechnology, these programmes provide advanced knowledge and hands-on skills, preparing graduates to excel in this rapidly evolving industry.



NANOSCIENCE

The nanoscience field of study is designed to prepare the students with nanoscience knowledge in any material field, including metal and metal oxides, carbon nanomaterials, nanocomposite and others. Nanoscience studies matter, particles, and structures at the nanometer scale, including atoms and molecules. It explores how these interactions lead to unique properties different from those observed in microscale materials due to quantum mechanics. Metal and metal oxide nanoparticles are noteworthy for their exceptional optical, electronic, magnetic, and electrochemical properties. Carbon nanomaterials, like carbon quantum dots, carbon nanotubes, graphene, and graphene oxide, are gaining prominence as emerging nanomaterials. Metal-organic frameworks (MOFs), a type of porous crystalline materials made up of metal ions linked by organic ligands, offer a fascinating class of nanomaterials with numerous potential applications. Various cutting-edge techniques will be employed to analyse and characterise nanomaterials, including microscopy and spectroscopy techniques as well as thermal analysis. These characterisation techniques help understand and exploit nanomaterials' unique properties for diverse industrial.

NANOTECHNOLOGY

The nanotechnology field of study is designed to prepare students with knowledge related to nanotechnology, which deals with developing state-of-art materials, devices, or other structures with at least one dimension sized from 1 to 100 nanometers. Nanotechnology harnesses the power of nanoscience to produce revolutionary nanomaterials and nanoscale components with limitless applications. It enables the creation of tailor-made materials with exceptional properties. Furthermore, nanotechnology can facilitate the establishment of interfaces between electronic and biological systems. Nanotechnology entails the application of fields of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, and microfabrication. Some typical nanotechnology applications are in sensors, delivery systems, 'smart' medicines, nanoabsorbents, nanoelectronics, nano-machines, active and intelligent packaging, and others.



ADVANCED MATERIALS

The advanced materials field of study is designed to educate students in materials and processes, emphasising the exploration and creation of engineered materials with exceptional or enhanced properties. These enhanced properties result in superior performance relative to conventional materials, effectively bridging the gap between high-tech and conventional industries at a graduate level. The primary goal of the programme is to equip students with comprehensive and multidisciplinary knowledge that addresses contemporary issues and practices in the field of advanced materials. This programme introduces students to advanced materials such as composites, ceramics, electronic materials, magnetic materials, smart materials, plastics, and polymers. By gaining an in-depth understanding of these topics, students are better prepared to address real-world challenges and contribute to the innovative advancement of various industries.

GREEN ENGINEERING

The green engineering field of study is designed to prepare the students to be able to integrate environmental impact assessment tools, adopt life-cycle thinking, ensure that all material and energy inputs and outputs are as inherently safe and inert as possible, minimise the depletion of natural resources, and avoid waste. Green engineering is a sustainable approach to the design, production, and use of processes, materials and products that minimise pollution, reduce risk to human health and the environment, and enhance economic viability and efficiency. With green engineering, critical decisions to safeguard human health and the environment are made early in the process or product development stage, maximising cost-effectiveness.



MICROGRIDS & OFF-GRID SYSTEMS

Provide reliable power in remote areas and during outages



ENERGY

The field of study in energy is designed to prepare students for design and develop most of new technologies related to harnessing energy. It encompasses fundamental and applied research on the development, design, and usage of renewable energy, energy storage and energy materials. Research areas for renewable energy covers solar, wind, biomass, and hydrogen, while energy storage covers technologies such as batteries, supercapacitors, and other methods to store energy for later use, enabling better integration of intermittent renewable energy sources. Energy materials such as advanced catalysts, photovoltaic materials, and high-performance materials are explored and developed to optimise their cost and performance, enabling economic viability for energy applications.

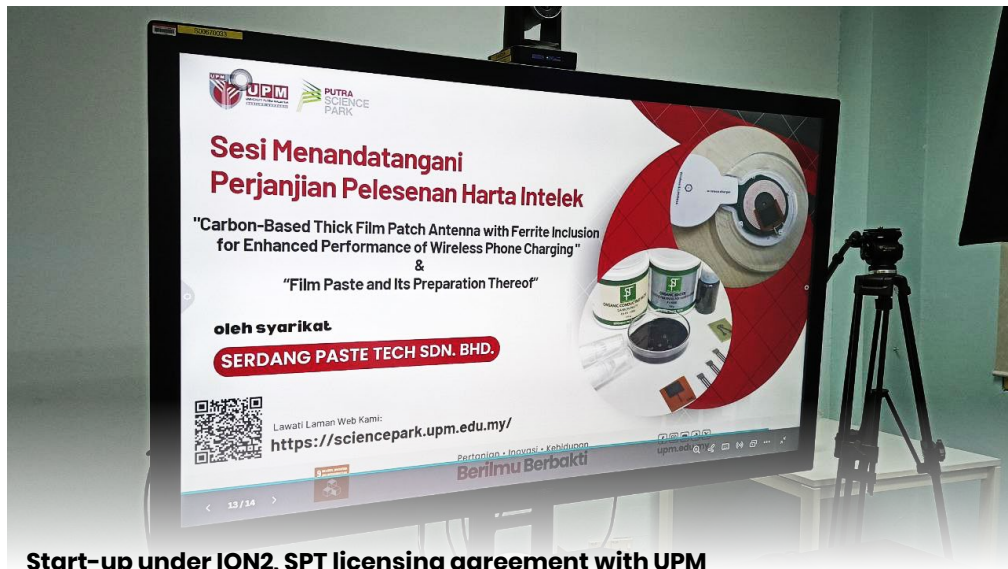
SENSOR TECHNOLOGY

The sensor technology field of study is designed to focus on the design and development of sensors to meet the needs for growth in products and services that utilise information from different types of sensors. Sensor technology has a very important role as the key technology to support a wide variety of research and industrial applications. It is also a vital element that can be applicable in agriculture, water quality, food security, the environment, and healthcare. The study of sensor technology can include sensor devices, physical sensors, biosensors, and chemical sensors. This programme aims to allow students to acquire knowledge of sensor technology covering the design, development, fabrication and performance analysis of the developed sensors.



LINKAGES & NETWORKING

INDUSTRIAL COLLABORATIONS



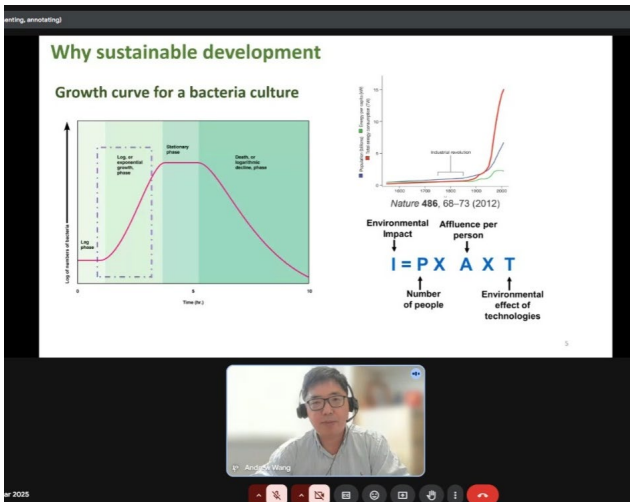
Start-up under ION2, SPT licensing agreement with UPM

Serdang Paste Tech. Sdn. Bhd. (SPT), a start-up under ION2, formalised its partnership with Universiti Putra Malaysia (UPM) through the signing of two technology licensing agreements, covering Film Paste and Its Preparation Thereof and Carbon-Based Thick Film Patch Antenna with Ferrite Inclusion for Enhanced Performance of Wireless Phone Charging, marking a key milestone in research commercialisation.



ION2-RGS Corporation Sdn. Bhd.: XRD Workshop on Mineralogy and Geology Applications

In partnership with RGS Corporation Sdn. Bhd., ION2 conducted a one-day XRD workshop on 21 August 2025, engaging 39 participants from universities and government agencies in practical insights on mineralogy, geology, and mining applications.



ION2-MBOT: Nanomaterials Technology Webinar 2025

In collaboration with MBOT, ION2 hosted the Nanomaterials Technology Webinar 2025 on 15 May 2025, drawing 181 participants from academia, government, and industry. The session featured Prof. Dr. Yun Wang (Griffith University, Australia) and Ir. Ts. Mohamed Syazwan Osman (UiTM Penang), who shared insights on materials simulation and nanotechnology applications in sustainable agriculture.

ION2-Pomega Energy Storage Technologies: Strategic Research Engagement

During his academic visit to Türkiye (27 August – 8 September 2025), Dr. Ismayadi visited Pomega Energy Storage Technologies in Ankara, Türkiye alongside Prof. Emre Gür (Eskişehir Osmangazi University). As a strategic partner in the MIGHT-TÜBİTAK Joint Research Project, the engagement centred on advancing lithium iron phosphate (LFP) battery cell technology and exploring opportunities in energy storage and sustainable power solutions.





**UPM–SLRI Webinar Series:
Introduction to Synchrotron
Research and Opportunities**

As part of ongoing engagement with the Synchrotron Light Research Institute (SLRI), Thailand, ION2 organised a three-part webinar series between July and September 2025. Delivered by Dr. Wutthikrai Busayaporn, the sessions introduced synchrotron research and highlighted advanced characterisation techniques, including XPS, XRF, and XAS.

Smart Farming @Sungai Burong

Reflecting its commitment to collaborative innovation, ION2 conducted a strategic site visit to the Paddy Observation Plot at the Sungai Burong Agricultural Center on 10 April 2025. The initiative facilitated dynamic knowledge exchange with the Department of Agriculture Malaysia, Qarbotech, and the Malaysian Nuclear Agency (MINT), featuring live demonstrations of crop-boosting photosynthesis enhancers and advanced drone-based plant health assessments.



Nanotechnology Applications in Food

Further strengthening its national visibility, ION2 was invited by the Johor State Health Department’s Food Safety and Quality Division to deliver a lecture during their Career Strengthening Course on 13–14 August 2025 at UTHM Batu Pahat. Representing ION2, Assoc. Prof. Ir. Ts. Dr. Siti Hajar Othman presented a talk entitled “Nanotechnology application in food products.” By providing officers with critical insights into emerging innovations, ION2 directly supported the state’s efforts to upskill its food technologists, ultimately contributing to improved regulatory oversight and safer public health practices.

UNIVERSITY LINKAGES



ION2–Universitas Brawijaya: Academic Visits and Research Attachment

ION2 hosted researchers from the Faculty of Dentistry, Universitas Brawijaya, Indonesia, for a three-day research attachment programme in January 2025, followed by a subsequent visit by the faculty's Dean and delegation in September 2025. The engagements encompassed academic exchanges, collaborative discussions, and exposure to ION2's research facilities.

UPM–Karadeniz Technical University (KTU), Türkiye: Research Attachment

Dr. Ismayadi Ismail underwent a research attachment at Karadeniz Technical University (KTU), Türkiye, in September 2025 under the guidance of Prof. Mehmet Ertugrul, focusing on the development and testing of electromagnetic absorber materials. The visit also reaffirmed the UPM–KTU MoU, strengthening commitments towards joint research, mobility programmes, and international funding initiatives.



ION2–Eskişehir Osmangazi University, Türkiye: Academic Visit

ION2 hosted Prof. Dr. Emre Gür from Eskişehir Osmangazi University, Türkiye, in September 2025 as part of an ongoing MIGHT–TÜBİTAK research collaboration. The visit involved joint experimental work, knowledge exchange, and a research seminar on advanced materials, further strengthening international collaboration with the involvement of Serdang Paste Tech.

UPM–Kyushu Institute of Technology (Kyutech): DSSC Workshop 2025

FNDL, ION2 organised a two-week Dye-Sensitized Solar Cell (DSSC) Workshop from 27 October to 7 November 2025, continuing its long-standing collaboration with Kyushu Institute of Technology (Kyutech), Japan. The programme brought together selected participants for intensive training in solar cell fabrication and research techniques.



COMMUNITY ENGAGEMENTS



NanoDidik @Negeri Sembilan 2025: Community Engagement Initiative

Extending its outreach beyond campus, ION2 co-organised NanoDidik @Negeri Sembilan 2025 on 17–18 June 2025 in collaboration with the National Nanotechnology Centre (MOSTI), Jabatan Pendidikan Negeri Sembilan (JPNS) and Sekolah Menengah Sains Rembau (SEMESRA). The two-day programme engaged over 200 teachers and students through interactive talks, hands-on activities, and science exhibitions, fostering interest in nanotechnology at the community level.



NanoDidik Impact: Empowering Students for Global Achievement

Through NanoDidik initiative, ION2 supported SEMESRA students in building foundational knowledge in nanoscience and nanotechnology, contributing to their success at the 1st International Nanotechnology Olympiad for High School (INOHS2025). The achievement, which included two gold and three bronze medals, reflects the impact of collaborative efforts between ION2, MOSTI, NNC, and educators in nurturing young scientific talent at the community level.

Nurturing Young Innovators at ION2

On 25 July, ION2 hosted students and teachers from SMS Tuanku Aishah Rohani (SGS) and SMS Tuanku Munawir (SASER), Seremban, Negeri Sembilan, for discussions on their innovation projects. The visit was part of the ongoing KTGS Project led by Assoc. Prof. Dr Yap Wing Fen.



Knowledge Transfer Programme on Self-Healing Bionanocomposite Films

Placing a strong emphasis on societal engagement, ION2 collaborated with Sekolah Menengah Sains Seri Puteri (SESERI), Kuala Lumpur, for the “Knowledge Transfer Programme on Self-Healing Bionanocomposite Films.” The initiative engaged students through expert mentorship, access to advanced laboratory facilities, and hands-on film synthesis, successfully bridging the gap between cutting-edge laboratory research and real-world applications. Through this 5-star-rated community project, ION2 supported the SESERI innovation team in building advanced nanoscience expertise, contributing to their remarkable success across various prestigious national and international competitions.



Sustainable Rice Farming @Tanjung Karang

Continuing its impactful outreach, ION2 led the “Program pemerkasaan penanaman padi berteraskan produk semulajadi” for the rice farming community in Sawah Sempadan, Tanjung Karang, Selangor. Spearheaded by Prof. Ir. Ts. Dr. Suraya Abdul Rashid, the initiative promotes environmentally friendly farming methods by introducing natural photosynthesis enhancers to rice cultivation practices, empowering local farmers to adopt sustainable agriculture.



STI MADANI: NanoDidik @UPM – Inspiring Science in the Community

ION2 hosted STI MADANI: NanoDidik @UPM on 10 December 2025, engaging over 500 students and educators from school communities across Selangor, including Sabak Bernam, Hulu Selangor, Klang, and Kuala Langat. Under the Ministry of Science, Technology and Innovation (MOSTI) STI MADANI initiative, the programme brought nanoscience and nanotechnology to life through hands-on experiments, interactive demonstrations, and a mini-innovation exhibition. Participants explored thrilling activities such as “Uncovering Hidden Layers”, “Dancing Magnets”, and Wireless Electricity, sparking curiosity and a deeper connection between the university and the community.

The event was officiated at the Jurutera Radin Umar Auditorium, Faculty of Engineering, with addresses by the Deputy Vice-Chancellor (Research and Innovation) and the Deputy Secretary-General (Planning and Science Culture), MOSTI. This collaboration highlights a strong institutional commitment to cultivating a science-literate society and demonstrates the lasting impact of community-focused science engagement.



MOBILITY PROGRAMMES

INBOUND AND OUTBOUND PROGRAMMES

Mobility	Program	Institution	Country	No. of Participant
Inbound	Research Attachment	Universitas Sebelas Maret	Indonesia	1
	Research Attachment	Universitas Brawijaya	Indonesia	4
	Online Short Course	Universitas Brawijaya	Indonesia	143
	Research Attachment and Workshop	Kyushu Institute of Technology	Japan	8
	The International Symposium on Advanced Materials and Nanotechnology (ISAMN) 2025	Mindanao State University	Philippines	1
Outbound	UPM-SLRI Webinar Series	Synchrotron Light Research Institute (SLRI)	Thailand	5

MOA SIGNING

Malaysia-Thailand Joint Authority (MTJA) | 15.05.2025 – 14.11.2027

ACTIVE MOU/MOA





ACTIVITIES

The 9th International Symposium on Advanced Materials and Nanotechnology (iSAMN2025)

The 9th International Symposium on Advanced Materials and Nanotechnology (iSAMN2025), ION2's annual conference, was held on 29–30 October 2025 as a hybrid event, bringing together researchers worldwide under the theme "Nanosciences for Sustainable and Inclusive Innovations for Planetary Well-being."

Physical sessions took place at Auditorium Rashdan Baba, UPM, with participants joining virtually from 10 countries. The opening ceremony was officiated by YBhg. Prof. Dr. Zamberi bin Sekawi, Deputy Vice Chancellor (Research & Innovation), UPM, and attended by ION2 leadership, including Assoc. Prof. Dr. Mas Jaffri Masarudin, Chairperson of iSAMN2025.

Highlights included keynotes by Prof. Dr. Meisam Tabatabaei (UMT) on sustainable soil enrichment and Prof. Ts. Dr. Hidayah Ariffin (UPM) on bio-based nanomaterials. The symposium featured over 50 presentations from 22 institutions, showcasing global advances in nanotechnology and sustainable innovation.

The symposium reinforced ION2's role as a hub for international collaboration, driving innovative solutions for a sustainable and inclusive future.





Materials Characterisation Workshop

ION2 successfully hosted the Materials Characterisation Workshop 2025: Exploring XRD and Raman Spectroscopy on 25–26 February 2025, bringing together researchers, academicians, and students from UPM and other institutions.

The two-day workshop provided in-depth sessions on X-Ray Diffraction (XRD) and Raman Spectroscopy, led by Dr. Low Yiin Jian (RGS Corporation) and Dr. Nizam Tamcheh (UPM). Participants gained practical insights into advanced materials characterisation techniques, enhancing their skills and understanding in this critical area of materials research.

Microfluidics Hands-On Workshop

The Microfluidics Hands-On Workshop 2025, held on 3 March 2025 in collaboration with Bristol University, brought together postgraduate students and researchers in materials science and nanotechnology. Designed to provide both theoretical and practical exposure, the workshop included a lecture on microfluidics platforms followed by a hands-on session where participants fabricated their own microfluidic device channels. The session was conducted by Dr. Irill Ishak, offering valuable skills and practical insights in microfluidics research.



Lateral Flow Workshop: Basics and Trends in Lateral Flow Tests

This workshop was held on 16–17 April 2025 by FNDL, focusing on the fundamentals and emerging trends in lateral flow technology. The first day featured online sessions by Prof. ChM Dr. Nor Azah Yusof and Dr. Muhammad Hafiznur Yunus, covering LAMP-based lateral flow systems and innovations in diagnostic testing. On the second day, participants engaged in an intensive hands-on session led by Dr. Hafiznur Yunus, preparing conjugate solutions with gold nanoparticles and fabricating their own lateral flow strips.

Nanocatalyst Workshop

Held on 15–16 July 2025 at ION2, the Nanocatalyst Workshop 2025 brought together postgraduate students from UPM and a research fellow from Sunway University. Lectures by Prof. Dr. Chawalit Ngamcharussrivichai (Chulalongkorn University, Thailand) and Ts. Dr. Umer Rashid (ION2) introduced key theories. This was followed by hands-on sessions where participants prepared nanocatalysts using sol-gel and co-precipitation methods before analysing them through various characterisation techniques.



Printed Electronics – Fabrication and Application in Nanotechnology (PEFAN2025)

The 8th edition of the PEFAN Workshop was held on 5–6 August 2025, allowing participants to explore the applications of printed electronics in nanotechnology. The workshop covered fundamental principles and advanced applications, including hands-on preparation of nanomaterial-based thick film pastes, screen printing, rheological and electrical conductivity testing, and assembly of simple printed circuits. Participants also visited Khai Lien Sdn. Bhd. to observe the stencil-making process, gaining practical insights into real-world printed electronics fabrication.

Pre-Conference Workshop Explores Crystal Analysis with XRD

Held on 27 October 2025 at the Mega Putra Seminar Room, ION2, the pre-conference workshop “Unveiling Crystals with XRD” was conducted in conjunction with iSAMN2025. Organised in collaboration with RGS Corporation Sdn. Bhd., the exclusive session introduced X-ray diffraction fundamentals, including powder and thin-film measurement techniques. The workshop concluded with hands-on data analysis using SmartLab Studio II software, guided by Ms. Carol Tiew Kai Ruo and Dr. Low Yiin Jian.



Intellectual Property Talk: From Lab to Market: Generating Income Through Intellectual Property

Organised on 20 June 2025 by the ION2 Postgraduate Club in conjunction with National Training Week (NTW) 2025, the talk "From Lab to Market: Generating Income Through Intellectual Property" highlighted the importance of managing and protecting intellectual property. The session, delivered by Assoc. Prof. Ts. Dr. Saiful Hasley Ramli (Putra Science Park, UPM), also emphasised the potential of translating research into commercial products. The webinar attracted 70 participants among postgraduate students and researchers.



Adjunct Professor Lecture Series

The talk "Evaluation of Research Proposal for MOSTI Funds: A Panel's Perspective" was delivered by Prof. Dr. Lee Yook Heng via Google Meet on 11 March 2025, providing insights into proposal evaluation and funding expectations.

The seminar "Biomass Conversion into Biofuels and High-Value Biochemical via Nanocatalyst" was presented by Prof. Dr. Chawalit Ngamcharussrivichai on 14 July 2025 at the Mega Putra Seminar Room, focusing on nanocatalyst applications in biomass conversion.



The talk "Carbon Quantum Dots in Catalysts" was delivered by Prof. Dr. Chawalit Ngamcharussrivichai on 27 July 2025 at the ION2 Seminar Hall, highlighting the role of carbon quantum dots in catalytic enhancement.



UPM Mobility Initiative Briefing

A briefing on the UPM Mobility Initiative was held online on 15 August 2025, featuring Farhan Boo Omar Boo, Head of the Mobility Division at PUTRA International Centre (i-PUTRA), UPM. The session provided updates on international mobility opportunities, funding schemes, and application procedures, attracting 70 students from various faculties and institutes.

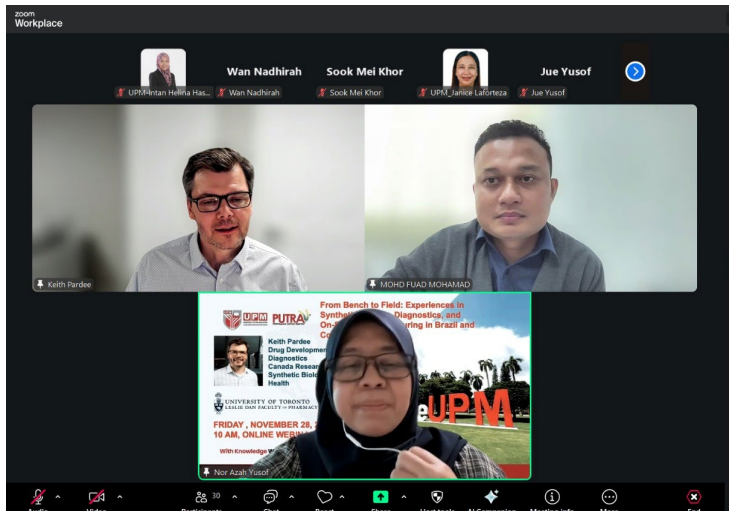


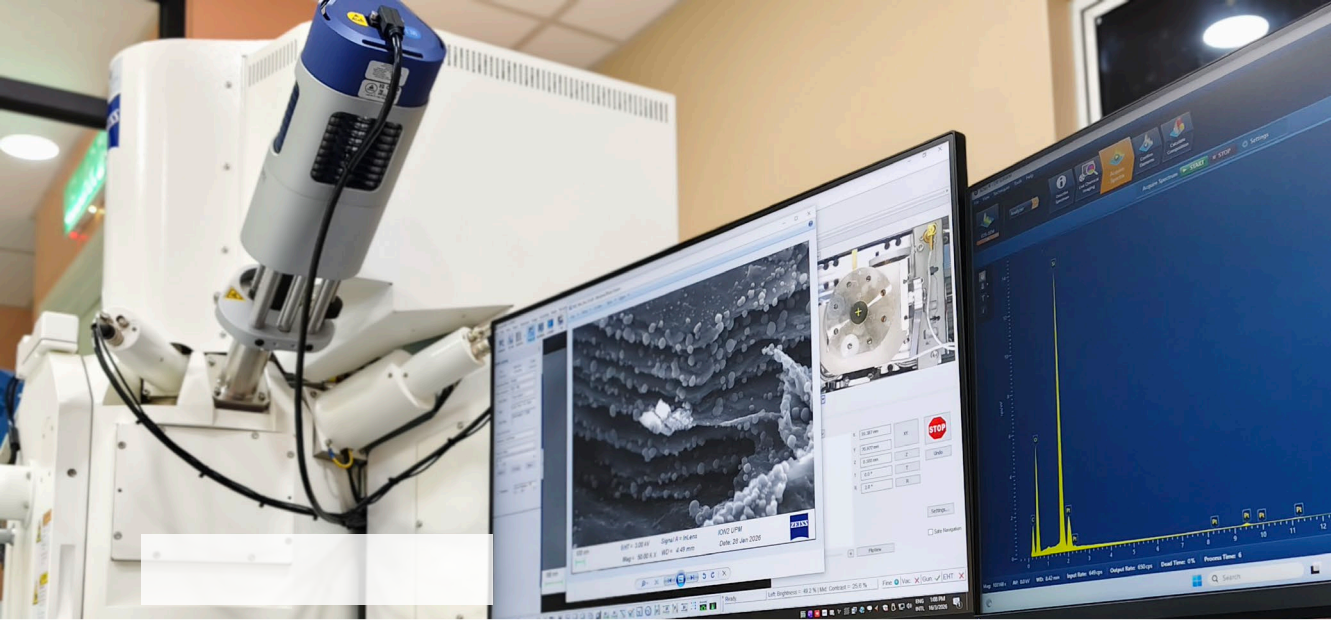
Prof. Suraya Delivers Inaugural Lecture on Green Nanotechnology

An inaugural lecture titled “Quantum Leap in Green Nanotechnology: From One to Zero, and Lab to Market” was delivered by YBhg. Prof. Ir. Ts. Dr. Suraya Abdul Rashid, Director of ION2, at the Radin Umar Engineer Auditorium, Faculty of Engineering. The lecture highlighted her two-decade research journey in carbon science, focusing on zero-dimensional carbon and its successful commercialisation as an eco-friendly “photosynthesis enhancer” for agriculture. Chaired by YBhg. Dato’ Ir. Dr. Ahmad Farhan Mohd Sadullah, the event attracted over 300 attendees.

International Webinar on Advances in Synthetic Biology and On-Site Biomanufacturing

An international webinar titled “From Bench to Field: Experiences in Synthetic Biology, Diagnostics, and On-Site Biomanufacturing” was held online on 28 November 2025, featuring Assoc. Prof. Keith Pardee (Leslie Dan Faculty of Pharmacy, University of Toronto, Canada). The session introduced cell-free synthetic biology platforms and their applications in diagnostics, highlighting cost-effective and portable solutions for resource-limited settings. Insights from biomanufacturing initiatives in Brazil and Colombia were also shared, demonstrating their role in enhancing public health responses and expanding access to biomedical technologies. The webinar attracted 30 participants.





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FACILITIES & Testing Services

Cutting-edge Laboratory & Testing Services at ION2

ION2 offers state-of-the-art laboratory facilities, and a comprehensive range of testing services tailored to research needs in nanotechnology and advanced materials. Our services include molecular analysis, thermal analysis, particle size analysis, mechanical testing, chromatographic testing, and magnetisation characterisation.

Beyond testing, ION2 also provides calibration services for electronic balances and standard weights, ensuring precision and reliability in scientific measurements. Committed to excellence, two of our laboratories; the Characterisation Laboratory and Mass Metrology Laboratory are MS ISO/IEC 17025 accredited, highlighting our dedication to high-quality standards and trusted research solutions.



Scan for more information:

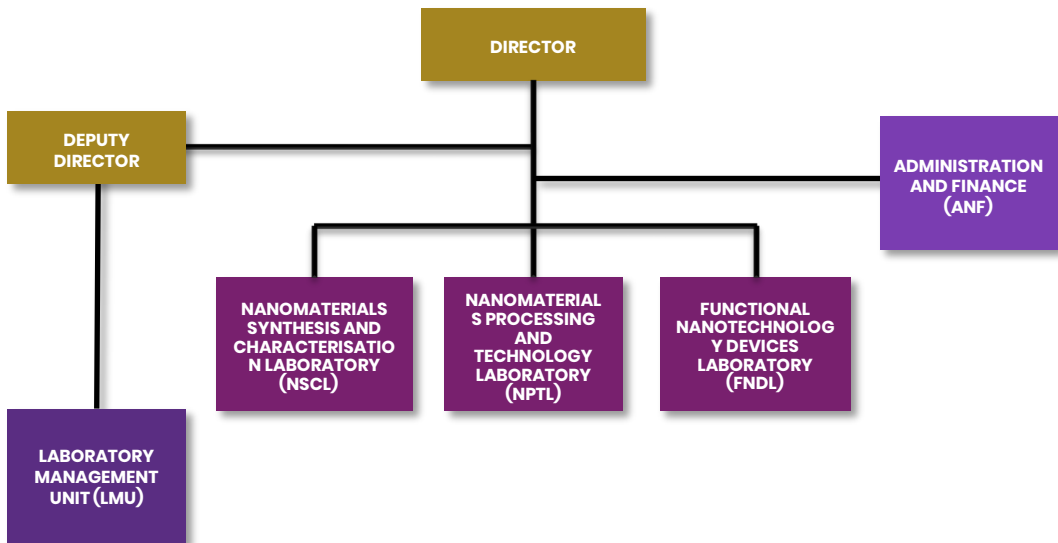
Contact us:

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MANAGEMENT & GOVERNANCE

ORGANISATIONAL CHART

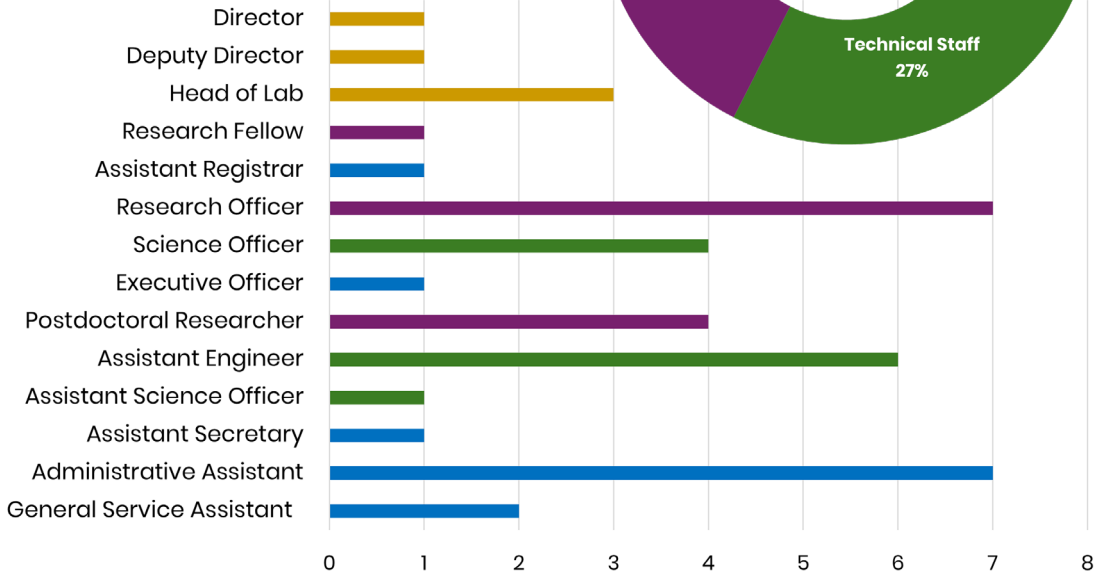
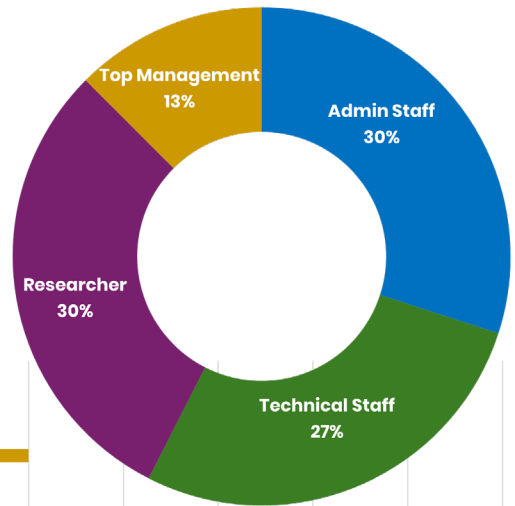


TOP MANAGEMENT

 <p>Prof. Ir. Ts. Dr. Suraya Abdul Rashid Director</p>		 <p>Assoc. Prof. ChM Dr. Jaafar Abdullah Deputy Director</p>	
 <p>Assoc. Prof. Dr. Mas Jaffri Masarudin Head of NSCL</p>	 <p>Assoc. Prof. Ir. Ts. Dr. Siti Hajar Othman Head of NPTL</p>	 <p>Assoc. Prof. Dr. Yap Wing Fen Head of FNDL</p>	
 <p>Wan Nur Syarmimie Wan Azman Head of ANF</p>		 <p>Md. Ali Rani Coordinator of LMU</p>	

HUMAN RESOURCES

ION2 is supported by a team of dedicated staff to facilitate the overall operation of the institute's functions and activities. In addition, several committees are also formed to implement and monitor various activities, including management of research and postgraduates, university-industry-community linkages, research funding, quality systems, and laboratory safety.



STAFF APPRECIATIONS

UPM Excellence Service Award 2024 Recipients

ION2 extends its congratulations to the staff who received Excellence Service Award (APC) for outstanding performance in 2024 during the Majlis Gemilang Putra (MGP) held on May 23.



Ts. Dr. Mohd Hafizuddin Ab Ghani
Research Officer



Mohamad Yunus Mohamad Syed
Administrative Assistant

ADMINISTRATION OFFICE

Director's Office

Director

Prof. Ts. Dr. Suraya Abdul Rashid

Administrative Assistant

Siti Hajarul Kasdi

Deputy Director's Office

Deputy Director

Assoc. Prof. Dr. Jaafar Abdullah

Assistant Secretary

Aiza Amiera Amir Sharifuddin

Administration and Finance Unit

Assistant Registrar

Wan Nur Syarmimie Wan Azman

Assistant Engineer

Ab Haffiz Ab Jalil
(Development & Facilities)

Senior Administrative Assistant

Zamzurina Abdul Wahab
(Human Resource Management & Development)

Administrative Assistant

Norliyana Mahat
(Finance – General Operations)

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Nor Azli Sulaiman
Muhammad Fikrul Hasani Che Musa

Planning and Performance Unit

Executive Officer 3

Siti Nur Lidiya Sharudin

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Rokiah Deraman
(Postgraduate Management)

Noor Linda Hassan
(Industry & Community Relations Management)

Mohamad Yunus Mohamad Syed
(Finance – Research & Income Generation)

Administrative Assistant

Mohd Eri Mohd Noor
(Research Management)

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Md. Ali Rani
ChM Sarinawani Abdul Ghani
Roslina Abdul Rashid
Nurnazeera Zulkefli

Assistant Engineer

Mohd Kadri Masaud
Noor Lina Shamsuddin

Assistant Science Officer

Nurshahida S Saleh



RESEARCH LABORATORY

NANOMATERIALS SYNTHESIS AND CHARACTERISATION LABORATORY

The Nanomaterials Synthesis and Characterisation Laboratory (NSCL) focuses on the synthesis and characterisation of nanomaterials, examining how their properties are influenced by morphology, reaction conditions, and processing parameters.

Research at NSCL covers both carbon- and non-carbon-based nanoscale materials, including zero- to three-dimensional nanostructures. Carbon materials include graphene, carbon nanotubes, and quantum dots, while non-carbon materials comprise metals, ceramics, and layered hydroxides with functional properties such as magnetic, dielectric, and superconducting behaviour.

The research laboratory employs a range of mostly green and scalable synthesis methods, including top-down and bottom-up approaches such as wet chemical, solid-state, chemical vapour deposition, and laser ablation techniques. Material characterisation is carried out using advanced tools including electron microscopy, spectroscopy (e.g., FTIR, Raman, XPS), and diffraction techniques such as XRD.

RESEARCH PROGRAMMES

Nanomaterials

The Nanomaterials Research Program focuses on the development and application of carbon-based, functional, and structural nanomaterials. Emphasis is placed on synthesis, characterisation, and practical applications across various fields, including energy, electronics, optics, medicine, agriculture, and water safety. By integrating fundamental scientific principles with cutting-edge technologies, the program aims to create innovative smart materials, advanced delivery systems, and sustainable eco-solutions. A diverse approach utilizes a range of techniques, from chemical synthesis to nanostructure engineering, to push the boundaries of what nanomaterials can achieve.

Healthcare Nanotechnology and Nanotoxicology

The Healthcare Nanotechnology and Nanotoxicology Research Program focuses on developing nanoparticle-vector systems for targeted therapeutics in diseases as well as innovative nano systems for disease diagnostics and studying nanomaterial persistence in biosystems. The program also aims to establish nanotoxicology profiles of various nanomaterials to mitigate risks associated with their use in healthcare, agriculture, and biotechnology applications.



LABORATORY MEMBERS

ASSOC. PROF. DR. MAS JAFRI MASARUDIN

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Expertise: Nanobiotechnology, Drug delivery, Anticancer Therapeutics, Microbial-Synthesis of Nanomaterials

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Karadeniz Technical University, Türkiye

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Expertise: BET and 3D Modeling Software

ROKIAH DERAMAN

Laboratory Personal Assistant

RESEARCH LABORATORY

NANOMATERIALS TECHNOLOGY AND PROCESSING LABORATORY

The Nanomaterials Technology and Processing Laboratory (NPTL) was established to meet research needs in the field of nanomaterial processing and nanotechnology applications. NPTL is developed to complement the ecosystem of institutes that aim to be leaders in the field of nanoscience and nanotechnology.

NPTL focuses on developing and promoting research in the processing of green nanomaterials, as well as the development of sustainable and innovative products for various applications. NPTL also has expertise related to agri-nanotechnology, which aligns with UPM's main research in agriculture.

The main activities of this laboratory are conducting research in related fields, offering postgraduate programmes and providing training and consulting services.

RESEARCH PROGRAMMES

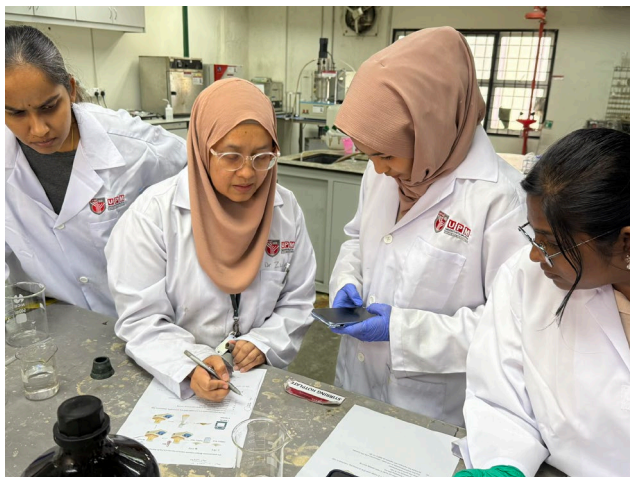
Environmental Nanotechnology

The Environmental Nanotechnology Research Program focuses on developing innovative nanomaterials and nanocomposites for environmental protection and pollution remediation. The program explores cutting-edge applications in water purification, green energy solutions, sustainable packaging, and catalysis while assessing the environmental impact of nanomaterials on natural ecosystems. Additionally, it aims to advance safe and sustainable nanotechnology practices to mitigate environmental risks and support long-term ecological resilience to support food security and sustainability.



Agricultural Nanotechnology

The Agricultural Nanotechnology Research Program focuses on developing innovative nanomaterials and nanocomposites to enhance agricultural productivity and promote sustainable farming practices. The program explores advanced applications in controlled and slow-release fertilizers, nanopesticides for efficient pest management, nanomaterials for optimizing soil and water use, seed coating, and smart packaging for food preservation to improve crop performance. Additionally, it aims to advance the safe integration of nanotechnology in agriculture to support long-term food security and environmental sustainability.



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ASSOC. PROF. IR. TS. DR. SITI HAJAR OTHMAN
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Expertise: Photoelectrochemical Cell, Fuel Cell

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Organic Chemistry, Phytochemistry

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Management

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and Polymer Science

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ZAKKY YAMANIE JAMIAUDDIN

Assistant Engineer
Certificate of Engineering (Politeknik TSM
Kulim)
Expertise: Mechanical Engineering

NOOR LINDA HASSAN

Laboratory Personal Assistant



RESEARCH LABORATORY

FUNCTIONAL NANOTECHNOLOGY DEVICES LABORATORY

The Functional Nanotechnology Devices Laboratory (FNDL) aims to be a leader in sensor technology and electron devices for nanotechnology and advanced materials. FNDL conducts innovative research related to advanced nanomaterials, such as carbon-based nanomaterials in the areas of sensors, electron devices as well as energy.

This laboratory aims to provide affordable, enabling green, and sustainable technology in advanced sensor technologies, advanced RF technologies, electronic nanomaterials and devices, and renewable energy. Research works also focus on nanoscale green synthesis and its application as the new niche area of the institute while promoting 17 Sustainable Development Goals (SDGs) and the 10-10 MySTIE framework.

We coordinate these technologies within FNDL and other laboratories in ION2, with other services agencies, industry, and academia, to leverage basic and applied research opportunities for the benefit of the nation.

RESEARCH PROGRAMMES

Sensor Nanotechnology

The Sensor Nanotechnology Research Program focuses on developing nanosensors using nanomaterials (eg. nanocarbons and quantum dots) for detecting environmental pollutants and healthcare biomarkers. These advanced materials enable sensitive, selective, and rapid detection, supporting environmental monitoring and medical diagnostics through compact, efficient, and cost-effective sensing technologies.

Energy and Devices Nanotechnology

The Energy and Devices Nanotechnology Research Program focuses on advancing next-generation energy storage and conversion devices by leveraging nanotechnology. The program primarily investigates applications including solar cell, supercapattery and batteries. The research integrates material science and nanotechnology to aim for real-world applications in clean energy and advanced power systems.



LABORATORY MEMBERS

ASSOC. PROF. DR. YAP WING FEN

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PROF. DR. LEE YOOK HENG

Adjunct Professor

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Insulation Ageing, and Diagnostics, Asset
Management and Alternative Insulation
Materials for High Voltage Power Equipment



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PROF. DR. NORHISAM MISRON

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MIEM, IEEJ
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Drive, Magnetic Sensor

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NOOR LINDA HASSAN

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LISTS OF COMMITTEES

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Deputy Chairman

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Dr. Siti Zulaika Razali
Ts. Dr. Mohd Hafizuddin Ab Ghani
Dr. Rosnah Nawang
Juraina Md Yusof
Mohd Ali Mat Nong
Mohd Eri Mohd Noor

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Ts. Dr. Mohd Hafizuddin Ab Ghani
Dr. Siti Zulaika Razali
Md. Ali Rani
Mohd Ali Mat Nong
Noor Linda Hassan

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Assoc. Prof. Dr. Yap Wing Fen

Secretary

Wan Nur Syarmimie Wan Azman

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Dr. Ismayadi Ismail
Dr. Rosnah Nawang
Dr. Siti Zulaika Razali
Mohd Ali Mat Nong
Juraina Md Yusof
Rokiah Deraman



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Deputy Chairman

Roslina Abdul Rashid

Secretary

Noor Lina Shamsuddin

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ChM Sarinawani Abdul Ghani
Nurnazeera Zulkefli
Nazrul Abdullah
Ab Haffiz Ab Jalil
Mohd Wafi Azimln Mohammad Jan
Mohd Kadri Masaud
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Nurshahida S Saleh

QMS MS 9001 COMMITTEE

Deputy Management Representative

Wan Nur Syarmimie Wan Azman

Deputy Document Control Officer

Mohd Ali Mat Nong

Deputy Customer's Satisfaction Coordinator

Siti Nur Lidiya Sharudin

Deputy Infrastructure & Facilities Coordinator

Ab Haffiz Ab Jalil

Deputy Internal Audit Coordinator

Dr. Rosnah Nawang

Internal Auditors

Md. Ali Rani

Roslina Abdul Rashid

Rokiah Deraman

Mohd. Wafi Azimin Mohammad Jan

Nazrul Abdullah

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Mohamad Yunus Mohamad Syed

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Nurshahida S Saleh (OSHA)

Rokiah Deraman (Postgraduate)

Norliyana Mahat (Finance)

Mohd Eri Mohd Noor (Research)

RISK MANAGEMENT COMMITTEE

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Secretary

Mohd Ali Mat Nong

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Dr. Ismayadi Ismail

Dr. Rosnah Nawang

Dr. Siti Zulaika Razali

Nurnazeera Zulkefli

Siti Nur Lidiya Sharudin

Ab Haffiz Ab Jalil

QUALITY MANAGEMENT SYSTEM – MS ISO/IEC 17025 COMMITTEE

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Deputy Quality Manager

Roslina Abdul Rashid

Technical Manager

Dr. Ismayadi Ismail

(*Characterisation Laboratory*)

Nurnazeera Zulkefli

(*Mass Metrology Laboratory*)

Deputy Technical Manager

Md. Ali Rani

(*Characterisation Laboratory*)

Noor Lina Shamsuddin

(*Mass Metrology Laboratory*)

Document Control Officer

Mohd Ali Mat Nong

Technical Staff/Competent Personnel

Md Ali Rani

ChM Sarinawani Abdul Ghani

Nurnazeera Zulkefli

Nazrul Abdullah

Noor Lina Shamsuddin

Zakky Yamanie Jamiauddin

Mohd Kadri Masaud

Mohd Wafi Azimin Mohammad Jan

Approved Signatory

Prof. ChM Dr. Janet Lim Hong Ngee

Prof. ChM Dr. Nor Azah Yusof

Assoc. Prof. ChM Dr. Jaafar Abdullah

Assoc. Prof. Dr. Khamirul Amin Matori

Dr. Ismayadi Ismail

ChM Sarinawani Abdul Ghani

Dr. Khairil Anas Md Rezali

Zamzuri Zabidin



QMS ISO 9001 Internal Audit – 21 & 22 May



QMS ISO/IEC 17025 Internal Audit – 13 & 14 May

OCCUPATIONAL SAFETY AND HEALTH (OSH) COMMITTEE

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Deputy Chairman

Md. Ali Rani

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Nurshahida S. Saleh

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Roslina Abdul Rashid
Nurnazeera Zulkefli
Nazrul Abdullah
Siti Nur Lidiya Sharudin
Wan Nur Syarmimie Wan Azman

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Ab Haffiz Ab Jalil
Mohd Wafi AzimIn Mohammad Jan
Mohd Kadri Masaud
Zakky Yamanie Jamiuddin
Noor Lina Shamsuddin
Zamzurina Abdul Wahab

Chemical Waste and E-Waste Coordinator

Nurshahida S Saleh

Radiation Worker

ChM Sarinawani Abdul Ghani
Mohd Kadri Masaud
Ab Haffiz Ab Jalil

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Assoc. Prof. Dr. Mas Jaffri Masarudin

Deputy Commandant

Md. Ali Rani

Liaison Officer

Nurshahida S Saleh

Planning

Roslina Abdul Rashid

Head of ERT Operation

Ab Haffiz Ab Jalil

Logistic

ChM Sarinawani Abdul Ghani

Finance

Noor Lina Shamsuddin

First Aider

Zamzurina Abdul Wahab
Muhammad Fikrul Hasani Che Musa

Fire Fighting Officer

Mohd Kadri Masaud

Evacuation Team

Mohd Wafi Azimin Mohammad Jan
Nazrul Abdullah
Zakky Yamanie Jamiuddin
Nurnazeera Zulkefli
Noor Linda Hassan
Noor Lina Shamsuddin

Traffic Control

Nor Azli Sulaiman

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Ts. Dr. Mohd Hafizudin Ab Ghani
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Siti Hajarul Kasdi

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Mohd Kadri Masaud
Aiza Amiera Amir Sharifuddin
Rokiah Deraman
Mohamad Yunus Mohamad Syed
Norliyana Mahat
Mohd Eri Mohd Noor
Norazli Sulaiman
Muhammad Fikrul Hasani Che Musa

PUBLIC SECTOR CONDUCTIVE ECOSYSTEM COMMITTEE (EKSA)

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Secretary

Siti Hajarul Kasdi

Coordinator

Siti Nur Lidiya Sharudin

Facilitator

Nurainakmal Kamal Bahrin (*Pusat Jaminan Kualiti*)

Head of Promotion Committee

Roslina Abdul Rashid

Head of Audit Committee

ChM Sarinawani Abdul Ghani

Head of Training Committee

Zamzurina Abdul Wahab

Head of Zone

Zakky Yamanie Jamiauddin (*Graphene Zone*)
Mohd Wafi Azimin Mohamad Jan (*Graphite Zone*)
Noor Linda Hassan (*Biochar Zone*)
Nazrul Abdullah (*CNT Zone*)

Sejiwa Serumpun Hijau dan Gotong-royong EKSA
16 May



ASSET MANAGEMENT AND DISPOSAL COMMITTEE

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Assoc. Prof. Dr. Yap Wing Fen

Deputy Chairman

Wan Nur Syarmimie Wan Azman

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Committee Members

Nazrul Abdullah
Mohd Kadri Masaud
Ab Haffiz Ab Jalil
Mohd Wafi Azimin Muhamad Jan
Zakky Yamanie Jamiauddin
Noor Lina Shamsuddin
Nurshahida S. Saleh
Norliyana Mahat
Mohamad Yunus bin Mohamad Syed

Aktiviti Gotong Royong Pelupusan Aset Bernilai Rendah
13 May and 31 July 2025



PICTORIAL

A visual roundup of the year's memorable moments not featured elsewhere in previous sections.



Majlis Perjumpaan Staf dan Amanat Tahun Baharu | 10 January



**Pencarian dan Pemusnahan Tempat
Pembiakan Nyamuk Aedes UPM
24 January**



**Jerayawara Penerbitan oleh Pusat Penerbit
UPM ke ION2
4 March**



**Perjumpaan dengan Editorial INSPEM
bersama JK Penerbitan ION2
5 March**



Majlis Iftar



22 March



Majlis Sambutan Hari Raya | 24 April



Majlis Sanjungan Budi dan Penghargaan Jasa | 25 July







AUDIT PENGEKALAN
 PROGRAM MASTER SAINS DAN DOKTOR FALSAFAH SECARA PENYELIDIKAN
 (DI BAWAH NATIONAL EDUCATION CODE (NEC)
 0530 : PHYSICAL SCIENCES NOT FURTHER DEFINED
 2 & 3 SEPTEMBER 2025

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**Audit SIRIM Sistem Pengurusan Kualiti ISO 9001
26 September**



**iSAMN2025 in frames — after the event,
backstage and the team behind it.**



**Team Building ION2 – Series 1
17 October**



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