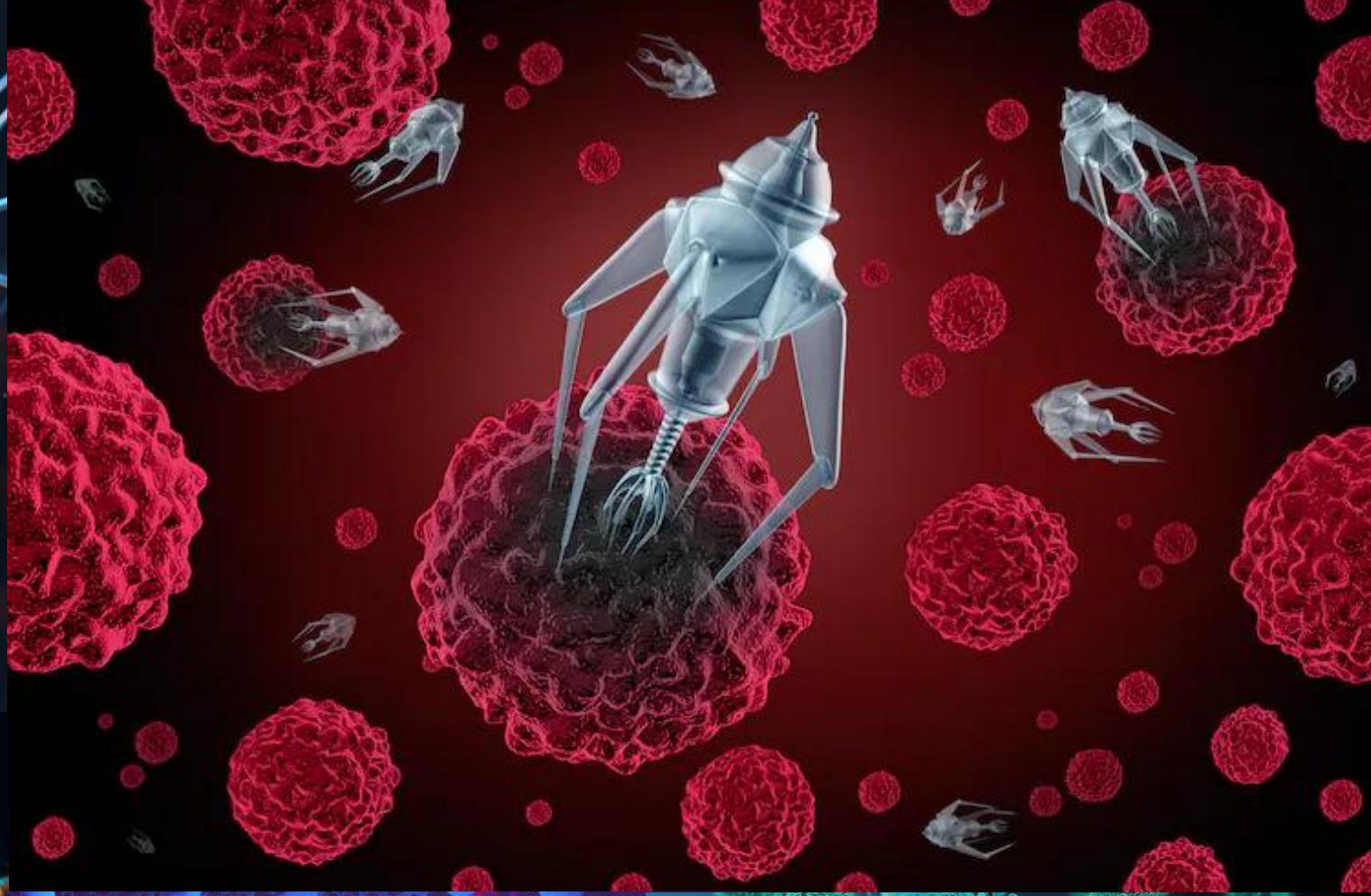
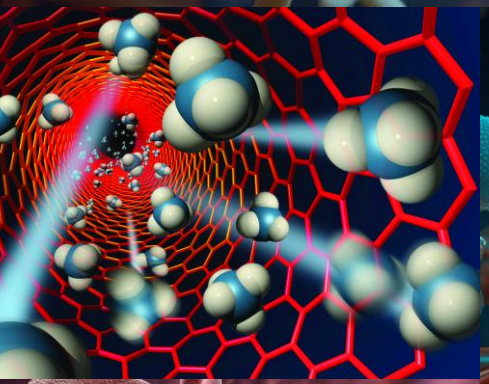
Master of Applied Sciences (Nanotechnology)

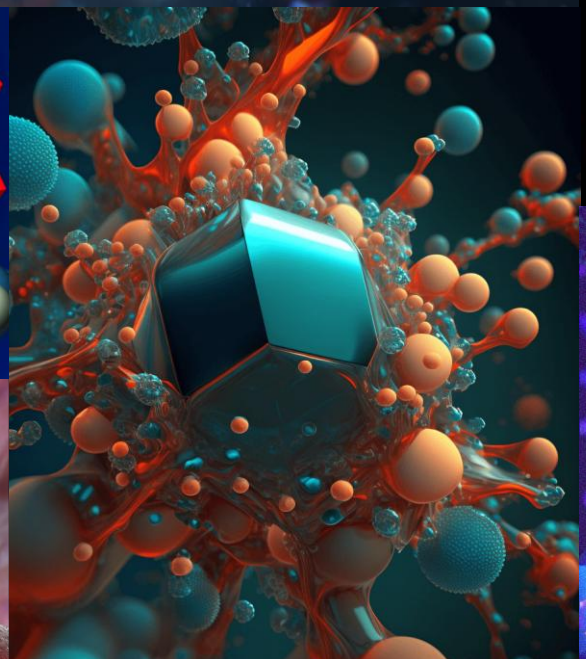
Home of the Bright, Land of the Brave
Di sini Bermulanya Pintar, Tanah Tumpahnya Berani

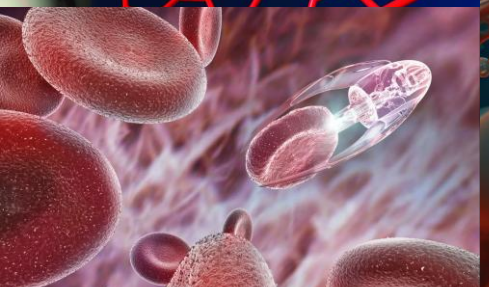
UNIVERSITI MALAYA

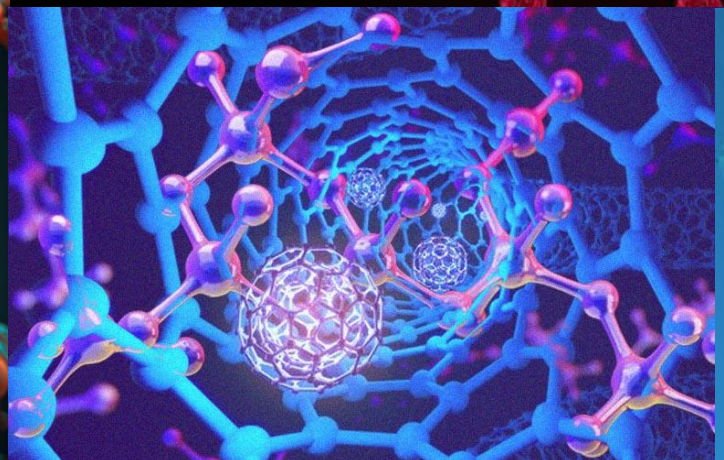
www.um.edu.my

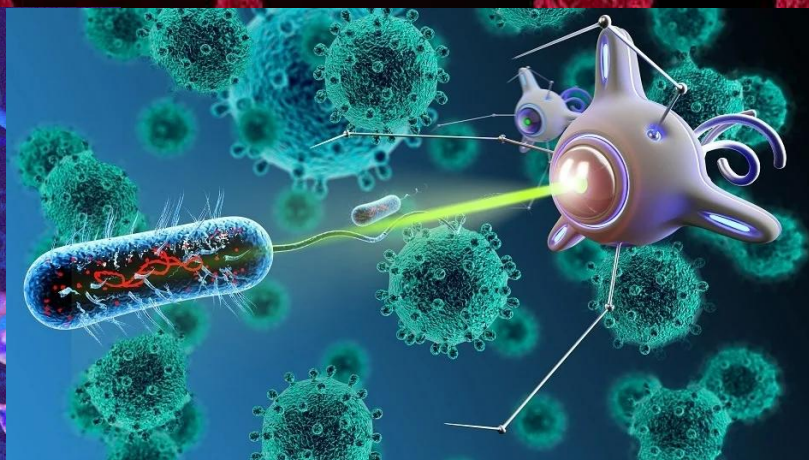










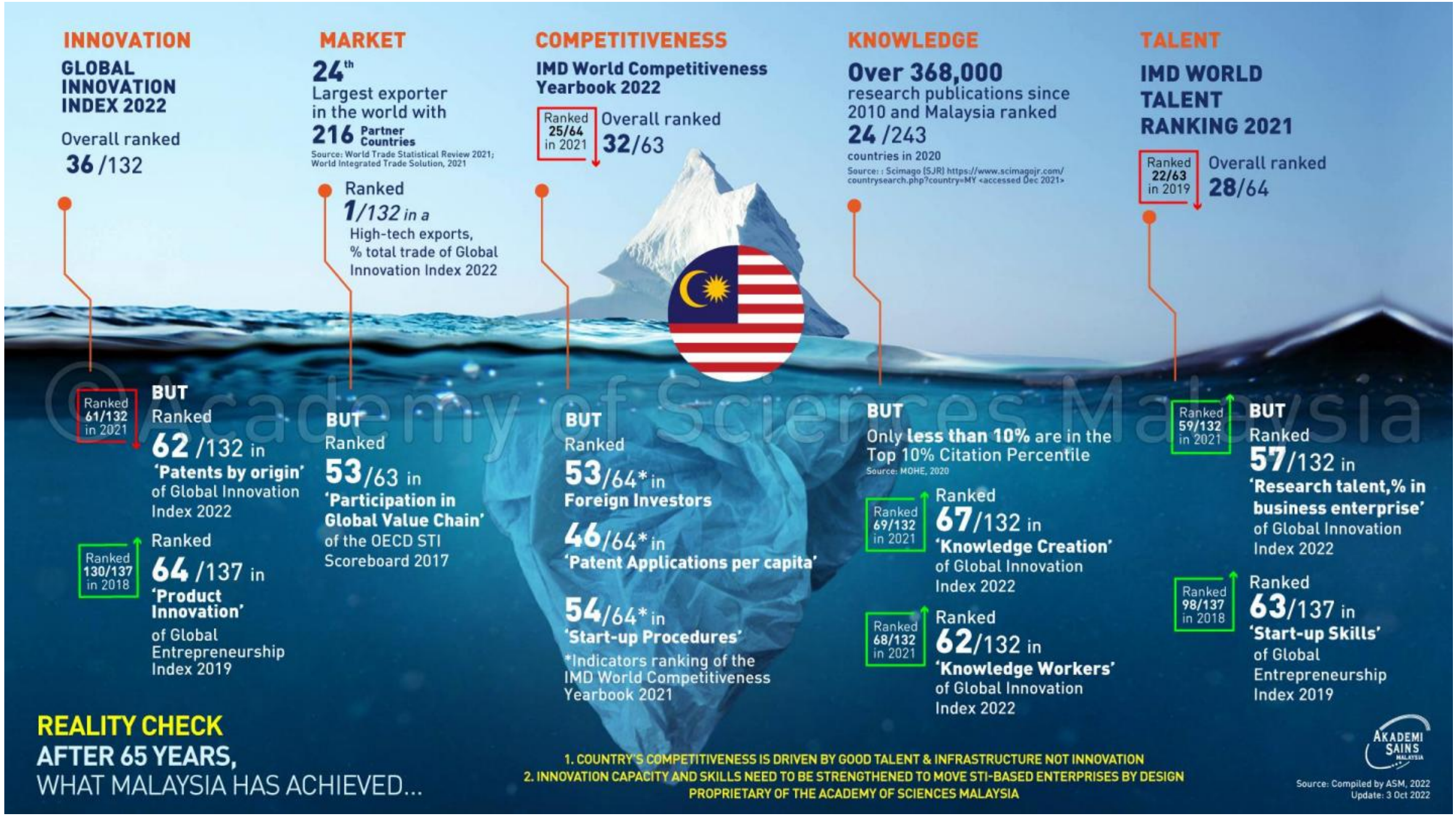


THE BIG MARKET OF SMALL

Nanotechnology Market Size to Surpass US$ 288.71 Bn by 2030

According to Precedence Research, the global nanotechnology market size is projected to surpass around US$ 288.71 billion by 2030 and expanding growth at a CAGR of 14.5% from 2022 to 2030.

April 15, 2022 11:45 ET | Source: Precedence Research



NATIONAL POLICY, STRATEGY & ROADMAP

On the same page

Closing the gap (or at least narrowing it)

National Nanotechnology Policy & Strategy 2021-2030

ISSUES & CHALLENGES			
6. Lack of total S&T talent planning and development to move STI agenda that also affecting nanotechnology's talent pool and the demand. **7.** Lack of effective approach in developing and attracting nanotechnology talent.			
STRATEGY			
2.4 Building a competent and adaptive nanotechnology talent with effective and fun STEM education integrating nanotechnology component.			
INITIATIVES	**SHORT-TERM (2021-2022)**	**MEDIUM-TERM (2023-2025)**	**LONG-TERM (2026-2030)**
2.4.1 Centralising national planning for nanotechnology talent development.	A national planning for nanotechnology talent development.	A structured collection of data on supply and demand of nanotechnology talent including the career and jobs opportunity. *50% talents in nanotechnology from the overall STI talents of the country by 2030.* *At least, 44,238 nanotechnology talents (high, semi & un-skilled workers) by 2030.*	

Closing the gap (or at least narrowing it)

National Nanotechnology Policy & Strategy 2021-2030

ISSUES & CHALLENGES			
6. Lack of total S&T talent planning and development to move STI agenda that also affecting nanotechnology's talent pool and the demand. **7.** Lack of effective approach in developing and attracting nanotechnology talent.			
STRATEGY			
3.4 Intensifying demand and attracting more and better talent to participate in the nanotechnology workforce.			
INITIATIVES	**SHORT-TERM (2021-2022)**	**MEDIUM-TERM (2023-2025)**	**LONG-TERM (2026-2030)**
3.4.1 Providing competitive salary and remuneration packages for nanotechnology talents which includes RSET.	A strategic planning and strategy for the revised salary and remuneration packages for nanotechnology talents.	1% increase in nanotechnology talents.	2% increase in nanotechnology talents.
3.4.2 Strengthening public-private partnerships in nanotechnology talent's skills development, entrepreneurship & academic training programmes.	Implementation of at least 2 strategic collaborative nanotechnology talent's skills development, entrepreneurship & academic training programmes with industries.	Implementation of at least 3 strategic collaborative nanotechnology talent's skills development, entrepreneurship & academic training programmes with industries.	Implementation of at least 4 strategic collaborative nanotechnology talent's skills development, entrepreneurship & academic training programmes with industries.
3.4.3 Implementing upskilling programme for the existing STI talents in nanotechnology.	At least 100 STI talents participated in nanotechnology upskilling programme annually.	At least 150 STI talents participated in nanotechnology upskilling programme annually.	At least 200 STI talents participated in nanotechnology upskilling programme annually. Increasing of 30,000 talents in nanotechnology by 2030.
34.4 Certifying nanotechnology professionals and technologists.	At least 50 nanotechnology professionals and technologists are certified.	At least 60 nanotechnology professionals and technologists are certified.	At least 70 nanotechnology professionals and technologists are certified.

Reskill

UNIVERSITI MALAYA

NANOCAT

Master of Applied Sciences (Nanotechnology)

Next intake: **October 2025**

Unlock your future via apply.um.edu.my

Upskill

COME AND JOIN US

Industry: *Explore joint industry-based research works as dissertation and benefit your company.*

Government: *Leveraging nanotechnology to position Malaysia as a high-tech nation.*

Individual: *Reskill and upskill through fundamental and applications of nanoscience and nanotechnology.*

PROGRAMME GOAL

The **Master of Applied Sciences (Nanotechnology)** program aims to provide candidates with **in-depth knowledge and skills** required in the field of **nanotechnology** in line with current developments.

THE PROGRAMME

42 CREDIT HOURS

1½ - 2 YEARS

WEEKEND CLASS

THE PROGRAMME

2 CORE

2 ELECTIVE

1 DISSERTATION

PROGRAMME STRUCTURE

Year	Component	Semester I			Semester II		
		Code	Course	Credit	Code	Course	Credit
1	Core Course	HOB7001	Research Methodology	3	HOB7002	Dissertation (P1)	12
	Core Course	HOB7003	Nanotechnology	3			
	Elective Courses (choose 1 each semester)	HOB7004	Design, Synthesis and Fabrication	3	HOB7005	Characterization Techniques	3
		HOB7006	Nanosafety and Health	3	HOB7007	Nanoelectronics	3
		HOB7009	Nanobiotechnology	3	HOB7008	Nanomedicine	3
		HOB7010	Environmental Nanobiotechnology	3	HOB7011	Nanobiotechnology in Food and Agriculture	3
		Credit Amount		**9**	**Credit Amount**		**15**
2	Core Course	HOB7002	Dissertation (P2)	18			
		Credit Amount		**18**			
Total Credit Amount (42 credits)				**27**			**15**

THE CORE SUBJECTS

Nanotechnology

Research Methodology

THE CORE SUBJECTS

- HOB7001 RESEARCH METHODOLOGY
- *This course focuses on establishing or advancing their understanding of research through critical exploration of research language, ethics, and approaches.*
- *The course introduces the language of research, ethical principles and challenges, and the elements of the research process within quantitative, qualitative, and mixed methods approaches.*
- *Students will use these theoretical underpinnings to begin to critically review literature relevant to the nanotechnology field and determine how research findings are useful*.

THE CORE SUBJECTS

- HOB7003 NANOTECHNOLOGY
- *The focus of this course is to equip students with the fundamental and applied perspectives on nanotechnology.*
- *This will promote students to deepen their understanding of the advantages and disadvantages of nanotechnology.*
- *This course also aims to enable students to evaluate and adapt new and emerging nanotechnologies in designing solutions for current sustainable development goals (SDG).*
- *Opportunities and entrepreneurships in nanotechnology will be explored.*

THE ELECTIVE SUBJECTS

Design, Synthesis and Fabrication	Characterization Techniques	Nanobiotechnology	Nanomedicine
Nanosafety and Health	Nanoelectronics	Environmental Nanobiotechnology	Nanobiotechnology in Food and Agriculture

* Select 2 only

THE DISSERTATION

Dissertation

- Industry-based research
- Using nanotechnology as solution
- Supervised by award-winning academic staff
- Access to the state-of-the-art research facilities
- In line with national policies and agenda

NANOCAT RESEARCH CENTRE

https://nanocat.um.edu.my

NANOCAT
NANOTECHNOLOGY AND CATALYSIS RESEARCH CENTRE

ABOUT NANOCAT

NANOCAT (Nanotechnology and Catalysis Research centre) is a pTJ incorporated by UM in 2012, a UMCoE. Its mission is to be a world leader in "catalysis and nanotechnology" coining sustainability and green technology. NANOCAT research thrust is deploying catalysis to support energy, chemical synthesis, environment pollution and global warming mitigation as well as designing smart materials as catalyst, sensor, nanocoating, and nanocomposite.

NANOCAT was given a status of HICoE Potential in 2013, in catalysis. The Centre has strived to attain a national status for HICoE (MOHE) as well as NanoCentre (NNC, MOSTI) with strong support and commitment from Universiti Malaya. In the last 4 years, 2016 to 2020, it witnessed a pronounced explosion in its productivity in all aspects.

NANOCAT PRODUCT

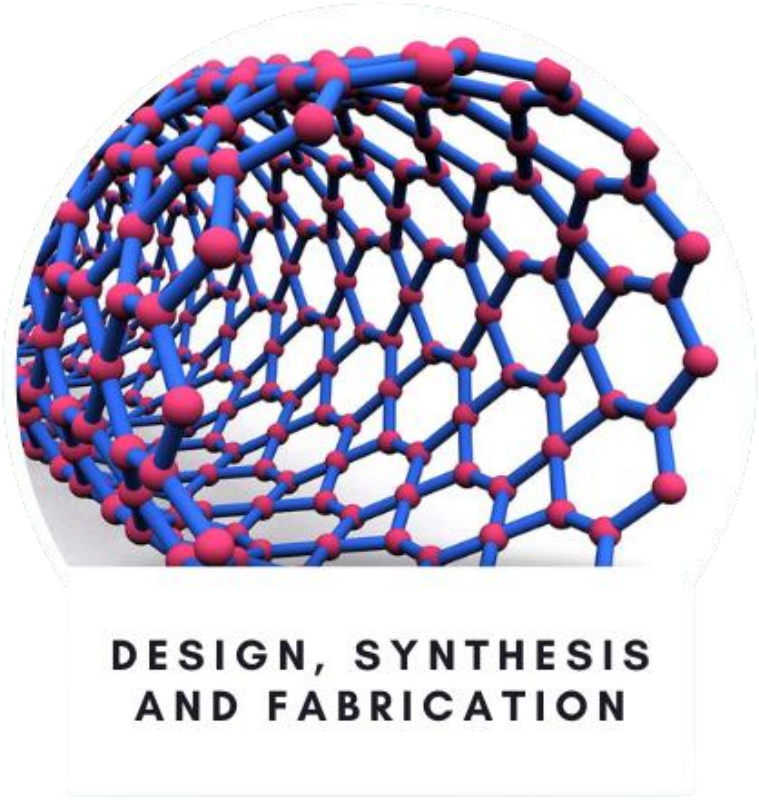
1. Highly Concentrated Graphene Oxide
2. Highly Dispersed Graphene Oxide Solution
3. Gel-like Graphene Oxide
4. Crude Graphene Oxide
5. Highly Stabilized Graphene Oxide
6. Graphene Powder
7. Graphene Oxide Flakes
8. Spongey-like Graphene Oxide
9. Flower-like ZnO/Graphene Nanocomposites
10. Rod-like ZnO/graphene nanocomposites
11. NanoCAT™IronAgro
12. NanoCAT™IronMedic
13. NanoCAT™Ironcoat

TECHNICAL SERVICES

1. Scanning Electron Microscope (SEM)
2. Raman Spectroscopy (RAMAN)
3. Elemental Analyser (CHNOS)
4. Fourier Transform Infra red (Ex situ-FTIR)
5. Fourier Transform Infra red (In situFTIR)
6. Differential Scanning Calorimetry (DSC)
7. Differential Scanning Calorimetry (In situ-DSC)
8. Zeta Potential (ZP)
9. Particle Size Distribution (PSD)
10. Thermogravimetry Analysis (TGA)
11. Thermogravimetry Mass Spectroscopy (TG-MS)
12. UV-Vis Spectroscopy (UV-VIS)
13. Vibration Sample Magnometer (VSM)
14. Hall Effect - Ball milling
15. X-Ray Fluorescence (XRF)
16. X-Ray Diffraction (Ex situ-XRD)
17. X-Ray Diffraction (In situ-XRD)
18. Karl Fischer Coulometer (KF)
19. Freeze Dryer
20. Autoclave 200 ml HS/SS
21. Density Meter
22. Selective Oxidation Fixed-bed Reactor (SELOX)
23. Precipitation Reactor (Lab Max)
24. Trickle Flow Reactor (TFR)
25. High Performance Liquid Chromatography (HPLC)
26. Gas Chromatography (TCD-FID)
27. Gas Chromatography (GC-MS)
28. Temperature Programmed Desorption, Reduction, and Oxidation (TPDRO)
29. Surface Area Analyser (BET Single Port)
30. Tensiometer (Surface Tension)
31. Fixed-bed Microreactor (atmospheric pressure).
32. Gel Permeation Chromatography (GPC)
33. Ion Chromatography (IC)
34. Nano Transition Metal Oxide Production Plan

+603-7967 6273 ts_nanocat@um.edu.my Nanotechnology and Catalysis Reserach Centre nanocat.um

THE ELECTIVE SUBJECTS



The course covers the design, synthesis and control of various materials synthesis at nanometer scale. It includes strategies for develop and synthesis of nanomaterials, surface engineering of various nanoparticle-based Nano systems for different application, toxicity aspects of nanomaterials and the challenges in translation research of hybrid nanomaterials. In addition, an overview of bottom-up and top-down methods used to design better nanomaterials, Nano devices and Nano machines by controlling the positions of the atoms, molecules, and molecular clusters in solution/solid state/substrate are precisely described based on the requirements. Synthesis and fabrication of different functional nanomaterials are presented with clear illustrations. The outcome of research finding provides versatile ideology to the researchers to enable the synthesis of nanomaterials in different shapes and sizes to meet the industrial requirements.

THE ELECTIVE SUBJECTS

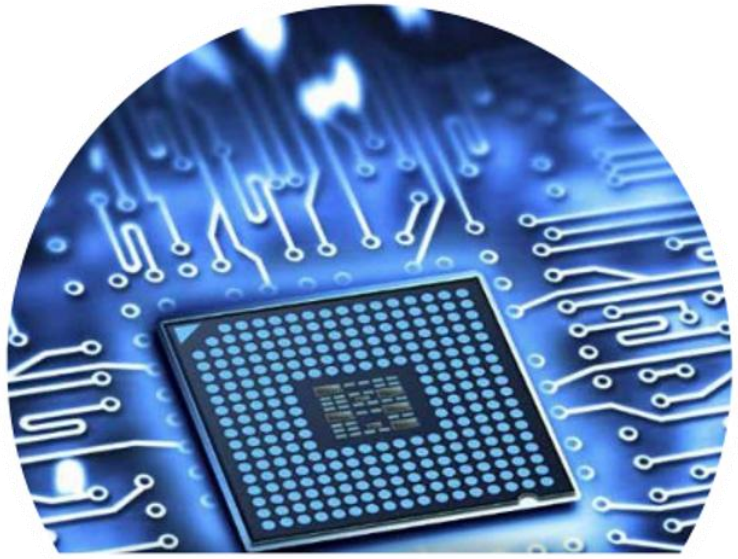
This course includes an introduction to nanomaterials characterization; the essential elements of the physical basis for x-ray and electron diffraction; imaging, optical and electron-optical microscopies - imaging at the macroscale to the nanoscale; Micro- and nano-analytical techniques; scanning probe techniques; Spectroscopies - techniques, with emphasis on surface and film analysis.

THE ELECTIVE SUBJECTS

This course is based on the best available emerging evidence on nanomaterial risks and internationally recognized best practice, (ISO, OECD, OSHA).

This course includes an awareness level course designed to bring students up to speed on the emerging risk issues and how to deal with them and a hands-on practical course to equip students with the necessary skills and knowledge to handle nanomaterials in a laboratory setting. This course also develops and runs bespoke courses tailored to the particular industry or application.

THE ELECTIVE SUBJECTS



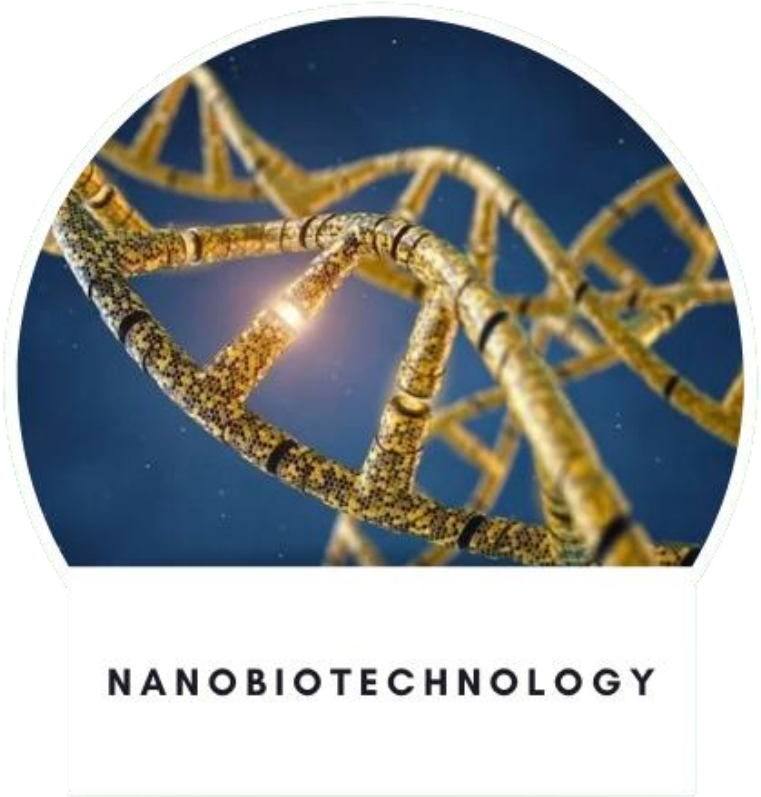
NANOELECTRONICS

The focus of this course is to equip students with the fundamental and applied perspectives on nanoelectronics. This will promote students to deepen their understanding of the current development and progress of nanoelectronics. This course also aims to enable students to evaluate and adapt new nanomaterials in nanoelectronics applications.

THE ELECTIVE SUBJECTS

The focus of this course is to equip students with the theoretical, practical, and critical thinking perspectives on nanomedicine, particularly in the drug delivery system and various disease models. This will promote students to deepen their understanding of technology and application of nanomedicine. This course also aims to enable students to evaluate and adapt new and emerging technologies in designing nanomedicine for effective treatment.

THE ELECTIVE SUBJECTS



This course will cover the broader aspects of bio-nanotechnology and its application in the biological System. It will provide knowledge about the Biologically inspired nanostructures – introduction to biomimetics and industrial applications of biologically inspired nanostructures and materials. This will provide an introduction to cell biology and bio-nanotechnology. The course will also provide technical knowledge about applied genomics and proteomics.

THE ELECTIVE SUBJECTS

This course will cover the broader aspects of bio-nanotechnology and its impact on the environmental system. It will provide necessary information for mapping and monitoring the environmental pollutants. The course will provide information on exposure to nanomaterials resulting from medical, occupational, environmental, and accidental release. Practical phase knowledge will be provided on prediction of biological properties of nanomaterials through the toxicological assessment, fate and risk of nanomaterials usage. The regulatory laws will be discussed for safe synthesis, handling, storage and disposal of nanoparticles in the environment.

THE ELECTIVE SUBJECTS

The course covers overview of the current state of this highly relevant topic, such as opportunities and challenges of nanotechnology in the agriculture and food sector, highlighting the scientific, technical, regulatory, safety, and societal impacts towards nanomaterials in food and agriculture sector. Furthermore, perspectives for the future, and provide insights into ways of assuring safety to obtain confidence for the consumer, as well as an overview of the innovations and applications.

ESTIMATED PROGRAMME FEES

RM29,700.00 (Malaysian)

RM46,100.00 (Non-Malaysian)

Updated as of August 2025

CAREER OPPORTUNITIES

- Scientist
- Technologist
- R&D engineer
- Industry expert and consultant
- Startup founder
- Chief Technology Officer
- Nanoscience and nanotechnology educator
- Specialist at industry and governmental agencies

ACADEMIC STAFF

PROF. DR. MOHD RAFIE JOHAN
Director of Nanotechnology & Catalysis Research Centre (NANOCAT)

Mohd Rafie Johan was a Professor of Materials Engineering in Department of Mechanical Engineering, University of Malaya. Currently, he is Director of Nanotechnology and Catalysis Research Center (NANOCAT), University of Malaya. He gained his PhD in 2005 from Department of Physics, University of Malaya. He is the author in 300 peer-reviewed (ISI) papers with H-index 36. Prof. Rafie is well recognized internationally in the field of Nanotechnology. Testimony to this, he has been elected in Evaluation Panels for AET and ITR clusters and UPGP and for grants applications at UMRG, PRGS, FRGS and Qatar Foundation. He has been appointed as a panel for Yang di Pertuan Agong Scholarship and COMSTECS for Islamic Organization Country for evaluation of best scientific Chemistry papers for Muslim Scientist. He also secured funding as PI from the University of Malaya,Malaysian Government, Industry and International Grant. Prof Rafie has been appointed the editor-in-chief of The International Conference of Science and Engineering Materials (ICOSEM). Prof Rafie has been invited as a speaker to numerous talks and conferences and also Guest Editor for Symmetry (ISI journal) and editor for Asean Engineering Journal. He leads Nanomaterials Engineering Research Group of 48 PhD and 22 Master. These supervised students span over a quite broad scientific area going from science (chemistry, physics, material science, biology) to engineering (chemical, material). He is the recipient of 2021 Top Research Scientist Malaysia by Academy Science Malaysia and top 2% top scientist 2020 by Elsevier. He is also Founder and Editor in Chief of Malaysia Nanoctechnolgy International Journal and Malaysian Catalysis International Journal.

ACADEMIC STAFF

PROF. DR. WAN JEFFRY BASIRUN
Deputy Director of Nanotechnology & Catalysis Research Centre (NANOCAT)

Wan Jeffrey Basirun is currently a Professor in Electrochemistry and Physical Chemistry started his career in the department of Chemistry, University Malaya as the department undergraduate tutor in 1991 upon graduation in bachelors in Science with honors majoring in Chemistry, and proceeded with a PhD degree in electrochemistry in 1997 from the University of Southampton in United Kingdom in 1997. Since joining the active research groups in the department of Chemistry in 1997, he has supervised a total of 17 PhD and 7 Master students to completion, in addition have authored and co-authored more than 200 papers in journals indexed ISI web of knowledge, with a H-Index of 26. His appointment as the Deputy Director in Nanocat in July 2018 is aimed to strengthen NanoCat's niche research areas. His research interest is on the use of nanomaterials and nanocomposites in catalytic processes, sensors, biomaterials and energy conversion and storage. He also top 2% scientist in the world in 2020 by Elsevier.

ACADEMIC STAFF

PROF. DR. JUAN JOON CHING
Professor

PhD, Chemistry
Uni. Kebangsaan Malaysia

Research Area
Chemistry of Catalysis
Biomass Energy Technology
Water and Wastewater Processes
Nanomaterials

ASSOC. PROF. DR. ONG BOON HOONG
Associate Professor

PhD, Materials Science
Uni. Kebangsaan Malaysia

Research Area
Nanomaterials
Magnetic and Semiconductor Nanostructures
Composite Materials
Nanocomposites and Devices

ASSOC. PROF. IR. TS. DR. LAI CHIN WEI
Associate Professor

PhD, Materials Engineering
Uni. Sains Malaysia

Research Area
Environmental Pollution Management Solar Energy Technology
Metal Oxide Semiconductor Materials
Nanomaterials

ACADEMIC STAFF

ASSOC. PROF. DR. NADER GHAFFARI KHALIGH
Associate Professor

PhD, Organic Chemistry Catalysis
Guilan University

Research Area
Synthesis
(Green Chemistry)
Organic Chemical Synthesis

ASSOC. PROF. DR. SURESH SAGADEVAN
Associate Professor

PhD, Materials Science
Madras University

Research Area
Nanomaterials
Nanocomposites
Biomaterials
Thin Films
Glass Materials
Photocatalysis,
Electrochemical Materials
Functional Materials
Crystal Growth

ASSOC. PROF. DR. LEE HWEI VOON
Associate Professor

PhD, Catalysis
Uni. Putra Malaysia

Research Area
Biomass Conversion Technology
Oleochemical Technology
Catalysis
Nanomaterials

ACADEMIC STAFF

ASSOC. PROF. DR. NURHIDAYATULLAILI MUHD JULKAPLI
Associate Professor

PhD, Biopolymer
Uni. Sains Malaysia

Research Area
Biopolymer
Biocomposites
Nanotechnology

DR. CHEE CHIN FEI
Senior Lecturer

PhD, Chemistry
Uni. Malaya

Research Area
Organic Chemical Synthesis
Organic Chemistry
Medicinal
Natural Products

DR. ZAIRA ZAMAN CHOWDHURY
Senior Lecturer

PhD, Environmental Analytical Chemistry
Uni. Malaya

Research Area
Micro & Nanostructured Carbon
Wastewater Treatment
Biomass Valorisation
Fixed Bed Studies
Fibre Polymer Composite
Photocatalytic Studies

ACADEMIC STAFF

DR. NOR ALIYA HAMIZI
Senior Lecturer

PhD, Materials Engineering
Uni. Malaya

Research Area
Semiconductor Materials
Quantum Dots Materials
Optical Characterizations

DR. YASMIN ABDUL WAHAB
Senior Lecturer

PhD, Microelectronics (Electronics Engineering)
Uni. Malaya

Research Area
Semiconductor Materials
Processes
Reliability Physics of Devices
Flexible Electronics
Nanobiosensors

DR. MARLINDA AB RAHMAN
Senior Lecturer

PhD, Experimental Physics
Uni. Malaya

Research Area
Nanomaterials
Graphene-Based Composites
Electrochemical Materials (Sensors, Biosensors)
Polymer Composites (Natural Rubber)

Thanks and let’s move on!

Scan Me

https://nanocat.um.edu.my/nanotechnology
https://apply.um.edu.my

Q & A SESSION