

GEM1537 - NANOTECHNOLOGY FOR EVERYONE- FROM SMART PHONE, INNOVATION TO ENTREPRENEURSHIP: SHAPING THE FUTURE

AIM

- ◆ This module aims to inspire students to shape the future towards sustainability with innovation and entrepreneurship enabled by nanotechnology. It is designed for students from all faculties.
- ◆ Starting from the technologies involved in making a smartphone.
- ◆ Trace the history of science and technology innovations to simulate curiosity and visual understanding of technologies
- ◆ Address the benefits for improving human lives and the environmental consequences today and tomorrow to help students understand the societal implication of scientific and technological innovation.
- ◆ Provides a unique exercise for students through team work projects to explore, experience and provide solutions (enhanced by nanotechnology) on issues towards sustainability (social, environment and economics).
- ◆ Has the privilege of attracting distinguished guest speakers from government funding agencies, research institutions, and industries in Singapore and elsewhere to share their deep insights on innovation, entrepreneurship, nanotechnology and sustainability.

Prerequisite:

No Prerequisite is required. But you need to know how to google with your smart phone!

Assessment:

2 tests (40%) - acquiring knowledge

group project presentations (35%) - problem solving, team work

Project essay(20%) - summary of individual contribution in the project

Debate (5%) - holistic thinking

TOPICS

Week 1: Nanotechnology Now

- Overview of the Innovative Nanomaterials and Manufacturing Process Transforming Industry and Economics

Week 2-7: Nanotechnologies Enabled by Smartphone Today and Tomorrow

- Greener Surfaces—Multifunctional materials enabled by Bioinspired Nanostructures
- A Bright Colorful World Without Poison—Manipulation of Light Enabling Lighting and Display

Week 8-10: Sustainability and an Exciting Future for ALL of Us

- Green Power—Solar Cells and Battery
- The Incredible Tiny Brain—Processors and Memory Enabled by NanoElectronics
- Disruptive Innovation, Business Opportunities and Changing Economics

- Global Nanotechnology Development – Key Drivers and World Leaders of Responsible Development of Nanotechnology
- What Does All the Electronic Waste Go - Impact on Environment
- Societal Implication of Nanotechnology – Environment, Health and Safety
- Sustainability, Innovation and Entrepreneurship- Career Opportunities



Quote from Invited Speakers



"Their innovation, enthusiasm, drive and pure innocence, portrayed wonderful ideas that makes the world a better place when implemented."

- **Lloyd SOONG**, CEO of Pasture Pharma Pte Ltd



"It is very heartening to see that students appreciate not only the business case for 'going green', but also the ethical importance of total life-cycle sustainability in whatever project, work, or theory they are studying. Each of them is equipped to make the world a much better place, regardless what role they choose to excel in after graduation."

- **Nick SMITH**, Media Relationship Manager, Asia Pacific, WWF

Quote from Invited Guests



"I am totally intrigued by the zest, creativity and innovation demonstrated by the students during their presentations. This interdisciplinary problem-based pedagogical approach provides our students an unique opportunity to translate what they learn in the classroom to solve a real-world problem. This learning experience in turn becomes part of the University's global efforts in preparing our students to become future-ready graduates"

- **Chan Chun YONG**, Vice Dean, Faculty of Science, NUS



"I am quite impressed by the enthusiasm of the students and the diversity of their projects. It is apparent that the students put in a lot of effort in the projects."

- **Yuan Ping FENG**, Head of Physics Dept, NUS

Module Highlight

The way Nanotechnology was taught in GEM1537 is unprecedented. After taking the module, students with different background are able to relate scientific principle and technological development to the real world. Through interdisciplinary team work project for designing solutions to solve real world problems and taking responsibility of the designed solutions, students learn to apply the knowledge learnt in the module for problem solving with holistic and responsible approach. This module stimulates students' creativity and passion for innovation and entrepreneurship inspired by invited speakers from successful industry executives.

Personalized Mentorship

Dr Liu and her teaching team provides over an hr per week personalized mentorship to each student during tutorial and beyond in guiding students with their project preparations



Fun Tutorial :

Bioinspired Nanostructure Demo provided by Dr Mathew Lim, Instructor of Department of Biological Sciences. Amazing butterfly colors variation demonstrating nanostructure enhanced color and nanostructure light manipulations directing insect behavior



Heated Debate on Si Solar Cells vs CIGS, Lead Acid vs Li Ion Battery, and LED vs CFL



Site Visit

Insti. of Materials Research Engineering (IMRE), A*STAR Students were exposed to the state of art nanotechnology user facilities and research capabilities as well as experience sharing by young scientists



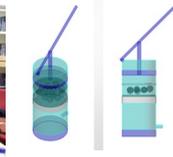
Module Lecturer

Dr. Lerwen LIU, an international nanotech expert, entrepreneur and physicist, who will guide you through the nano world, unlocking the smart phone, exploring innovation and entrepreneurship, together creating a sustainable future.

- Manager Director of NanoGlobe



Group Project Highlight

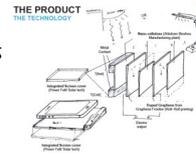


PortFits™ - Sustainability Award

Solutions for long term clean, safe and affordable drinking water

P-MAX - Entrepreneurship Award

2-in-1 mobile phone cover and charger that harnesses the power of solar and thermal energy to meet your smartphone's never-ending power needs



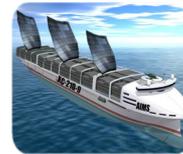
E-BUS for a Better Future - Improving Life of People Award



Emission free campus bus with minimum carbon footprint

AIMS - Improving Life of People Award

Advanced Innovative Marine Systems - Empowering Innovation, Connecting Worlds
An ambitious project for creating a ultimate green cargo ship free from pollution of the sea



Quote from Students

"Taking GEM1537 enhanced my interest in nanoscience and technology by elaborating on the different aspects of nanotechnologies such as policy, applications, industry and economic impact, career opportunities and sustainability "

- **Bae Soo KYUNG**, School of Design & Envi.



"GEM1537 is unlike any other modules, it really exposes me to many amazing technologies in the market and teaches me to look everything in a holistic manner, and encourages a lot of creativity and many room for us to maximize our potential "

- **Han Yuen Sze**, Faculty of Engineering

"It opened my eyes to the complex reality where science is so intricately connected to every aspects of life. I also like that there is no final exam which allows students to concentrate on learning instead of mugging.

- **Dewi Adrini Bte Affandi**, Faculty of Arts & Social Sci



"This module has helped me grasp the fundamentals of nanotechnology and its myriad commercial applications. Overall, this module has left me with a better understanding of the science and business behind nanotechnology, and most importantly the endless future possibilities."

- **Pang Dao Jian Colin**, NUS Business School