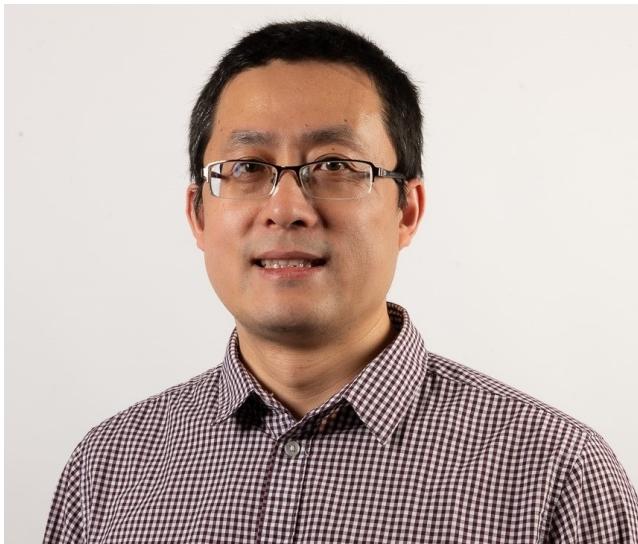


Course Instructor: Dr. Qichun Yang



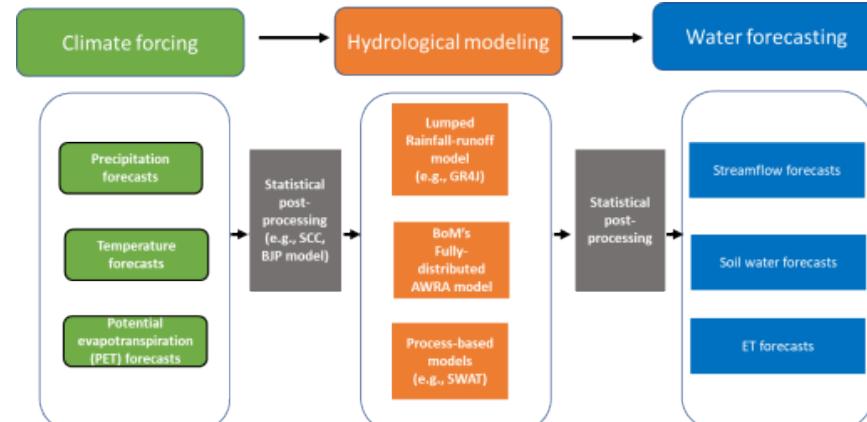
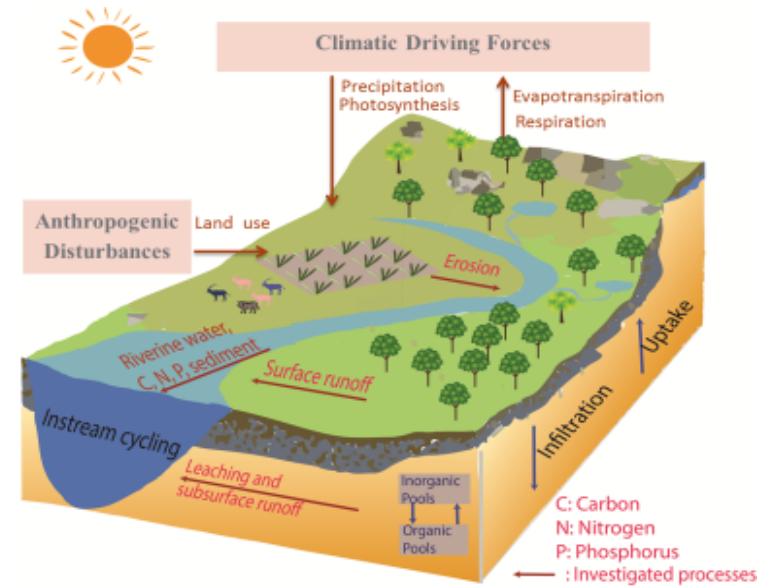
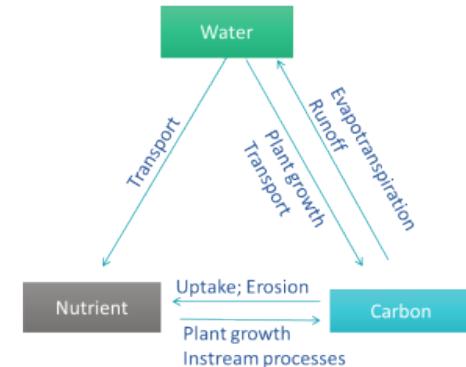
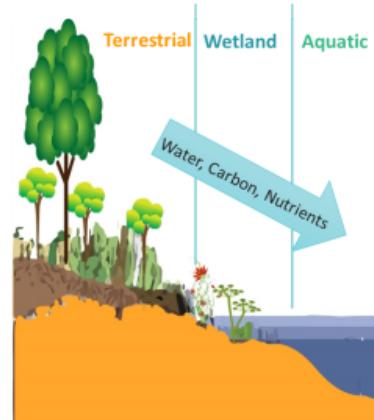
Qichun Yang (杨其纯)

HKUST (GZ)
Senior Lecturer

Email: qichunyang@hkust-gz.edu.cn

Research Area and Interest

- Watershed modeling based on conceptual and process-based models
- Riverine carbon cycling analysis based on modeling and field investigations
- Water quality modeling and pollution control
- Numerical Weather Prediction and post-processing
- Hydroclimate modeling and water forecasting
- Terrestrial > Wetland > Aquatic for fast hydrological modeling



2024.4

Guangdong , China



www.Baidu.com

2024.8

www.youtube.com

Liaoning , China



2024.8

Xinjiang, China



2024.4

Dubai, United Arab Emirates



sky news .com

shippers on fire outside mosques in West London and Birmingham

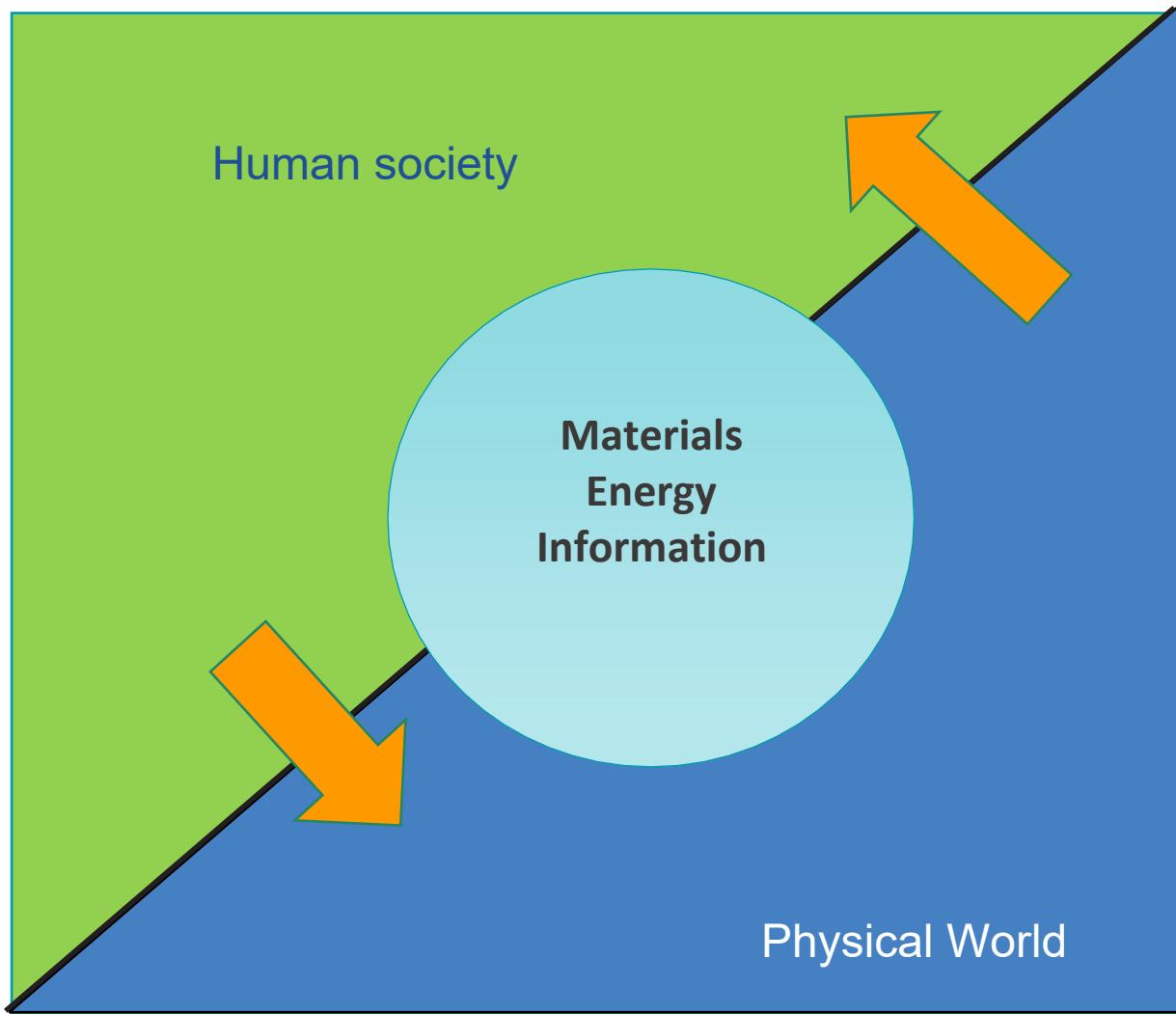
Actor Hugh Gran

Increasing evidence shows that we are facing sustainability threats!

What happens to the climate system?

What can we do to alleviate/fix the problem?

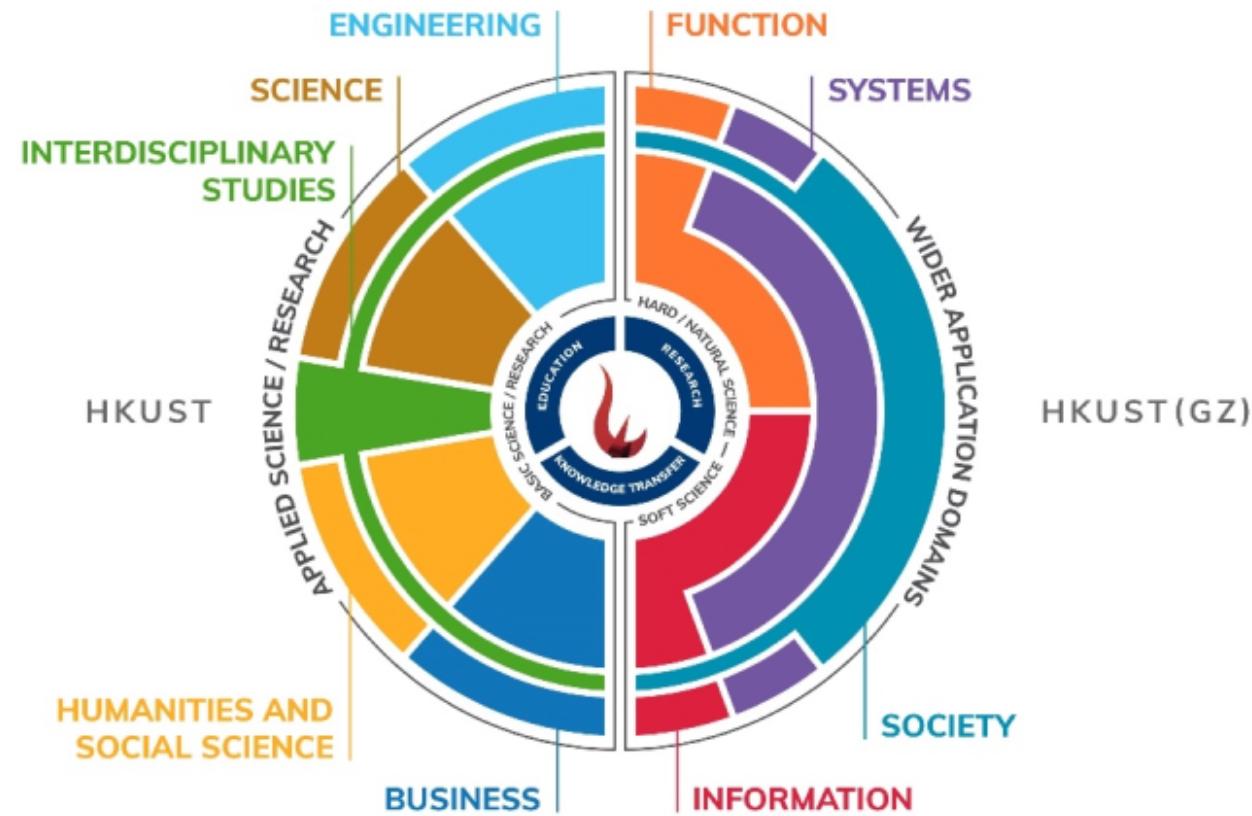
Environmental Challenges



Vision and Academic structure of HKUST(GZ)

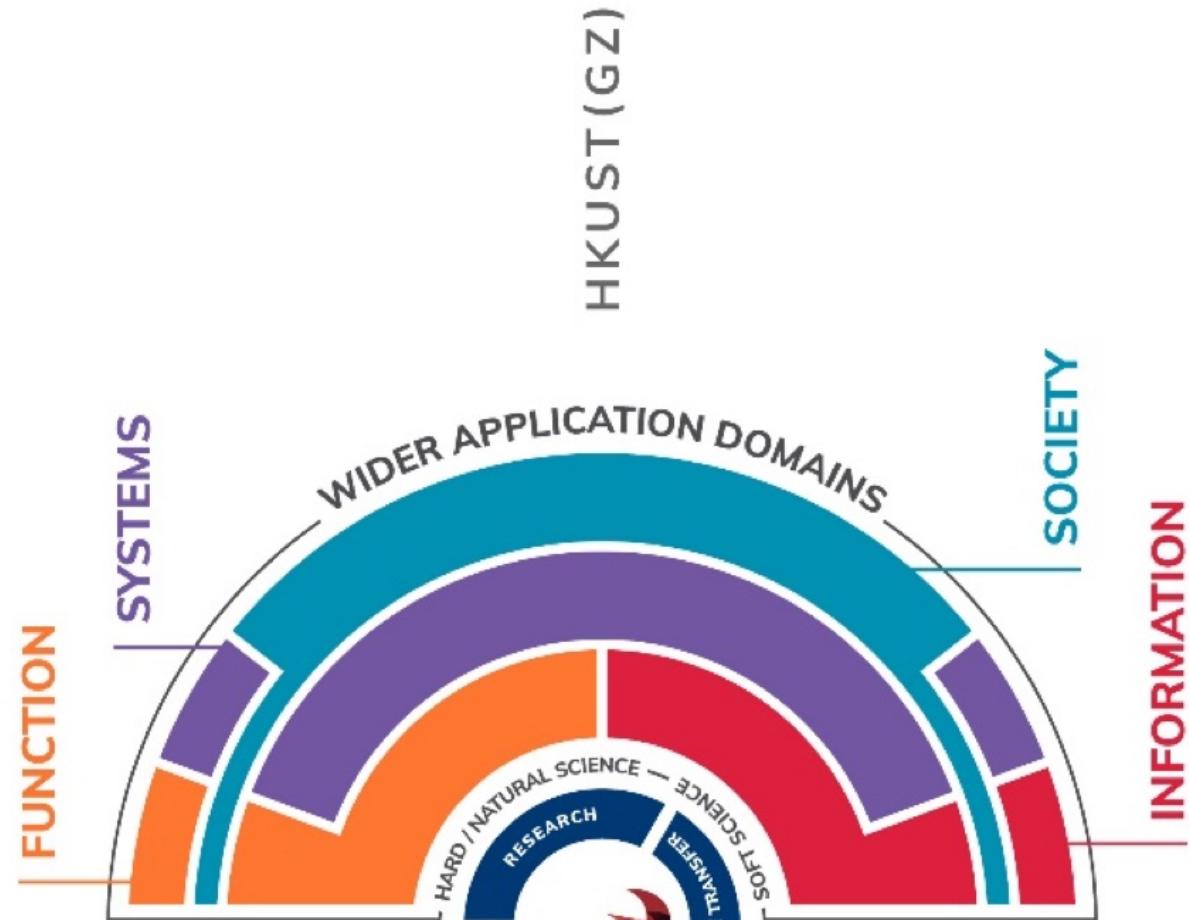
“We aim to empower our students the essential ability to create effective interventions for **real world challenges** of the 21st century”

- Cross-disciplinary in HKUST-HKUST(GZ) education and research is an integrative approach



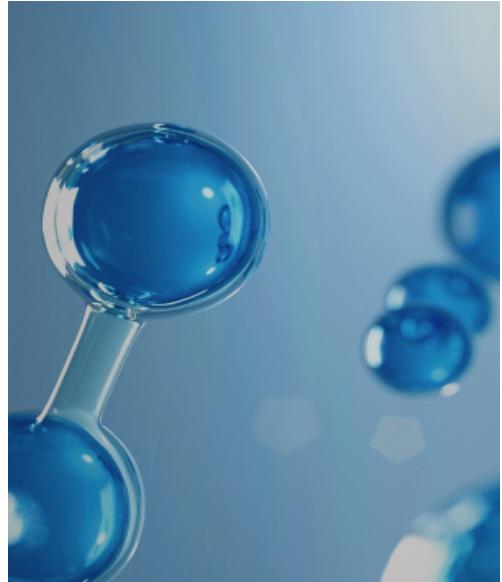
Role of Function Hub

- **Function and Information work together and provide the fundamentals to build Systems that supports Society**
- **Feedback from the community returns to Systems via Society and reaches Function and Information.**



Function Hub

Advanced
Materials



Function Hub

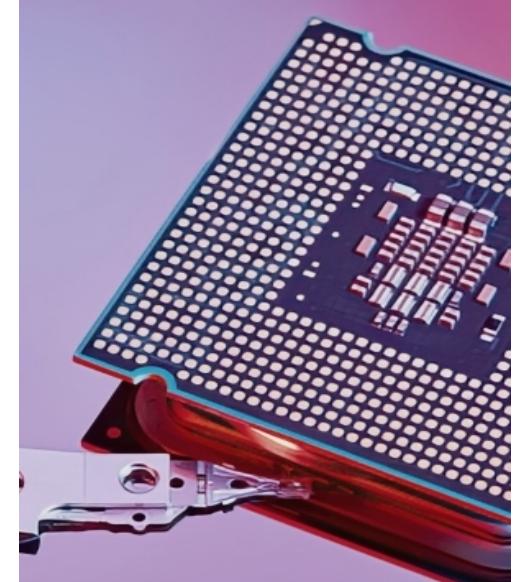
Earth, Ocean and
Atmospheric Sciences



Sustainable Energy
and Environment



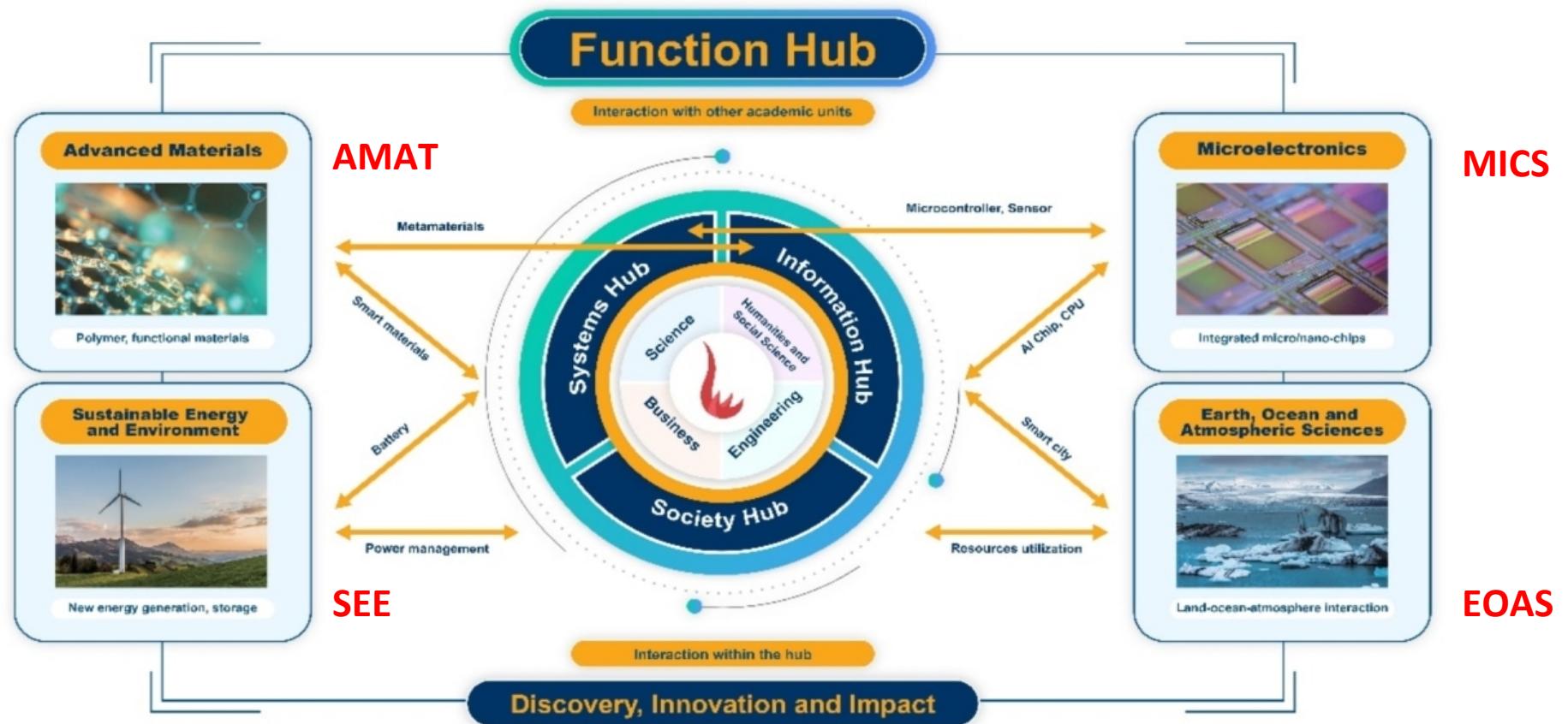
Microelectronics



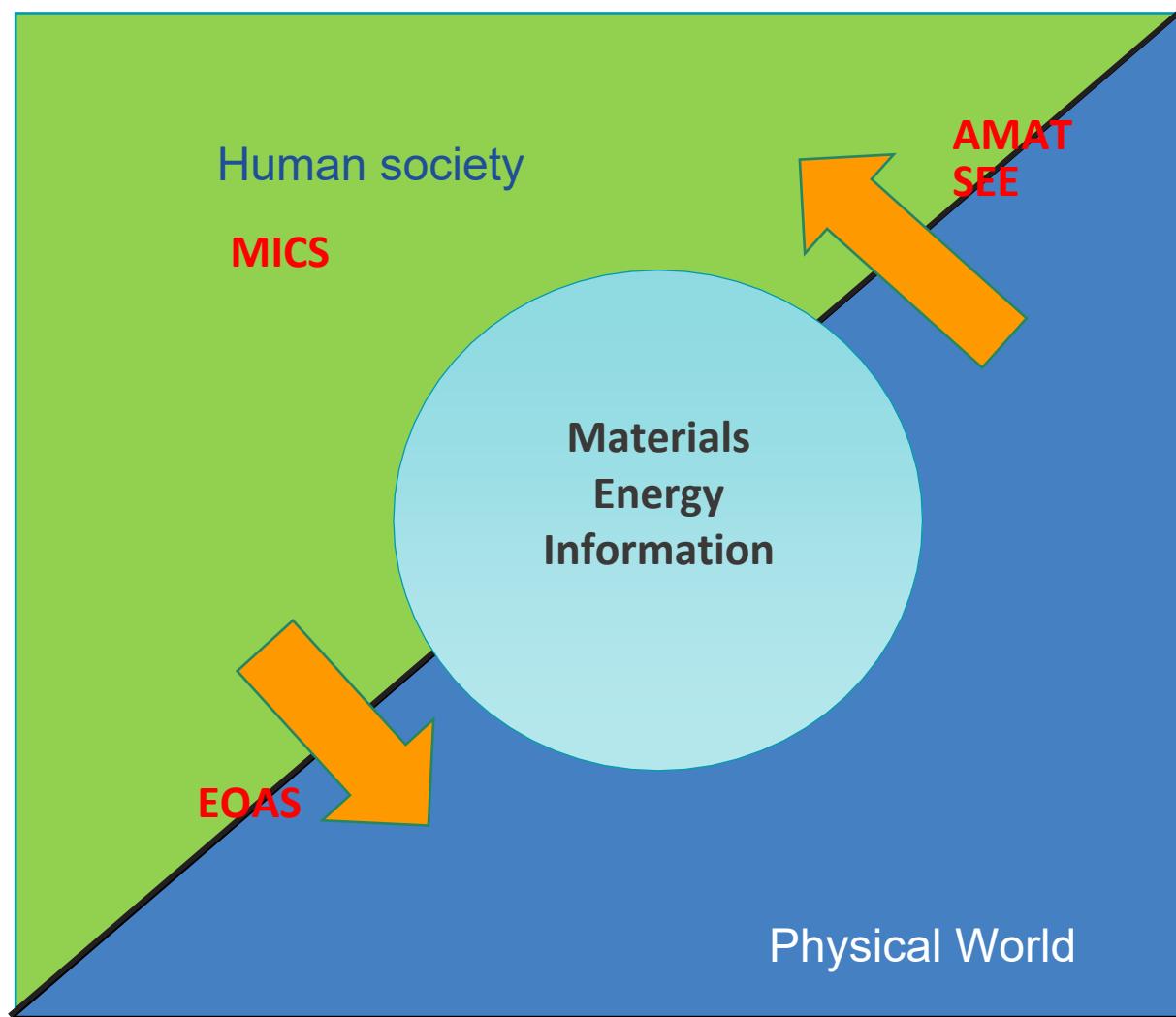
Function Hub

Vision of FUNH: “Unlock the potential of basic elements in hard and natural sciences, and seek advanced and sustainable solutions to address real-world problems, thus benefitting mankind and the advancement of humanity”

- 科学有高度
- 应用有前景
- 社会有影响



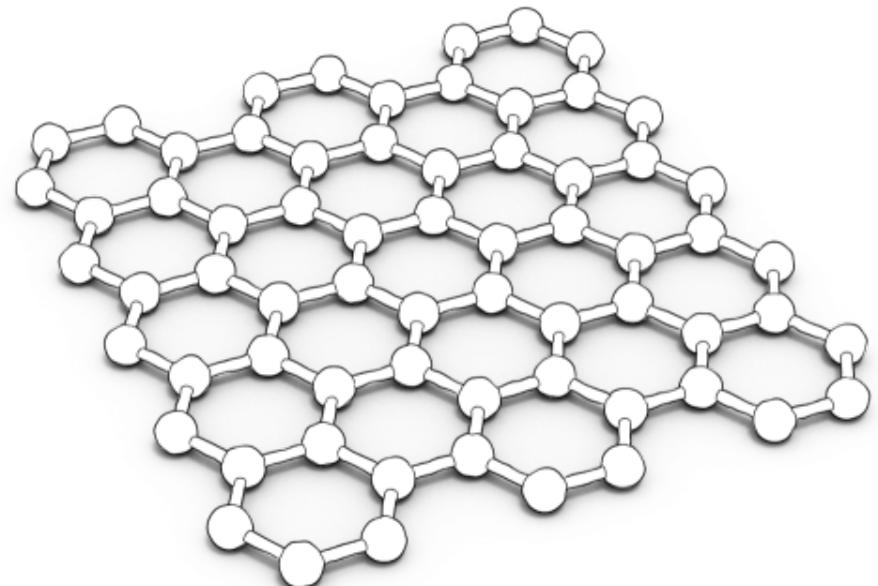
Thrusts of Function Hub



Research of the AMAT Thrust

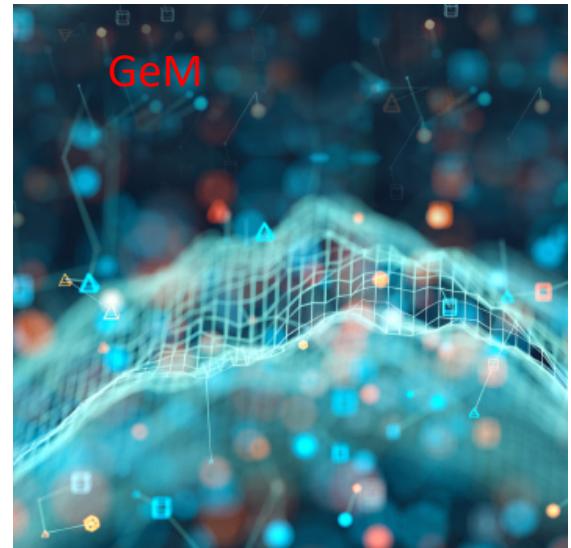
AMAT: “To rigorously explore the fundamental materials structure and property relationships; To unlock the potential of basic elements of natural sciences for conducting cutting-edge research for materials discovery and innovation; To become a global leader in functional materials research and development.”

- Functional polymer materials
- Metamaterials
- Bio-engineering and bio-medical materials
- Optoelectronic materials
- Quantum materials
- Electronic materials
- Materials Informatics
- Wearable sensors



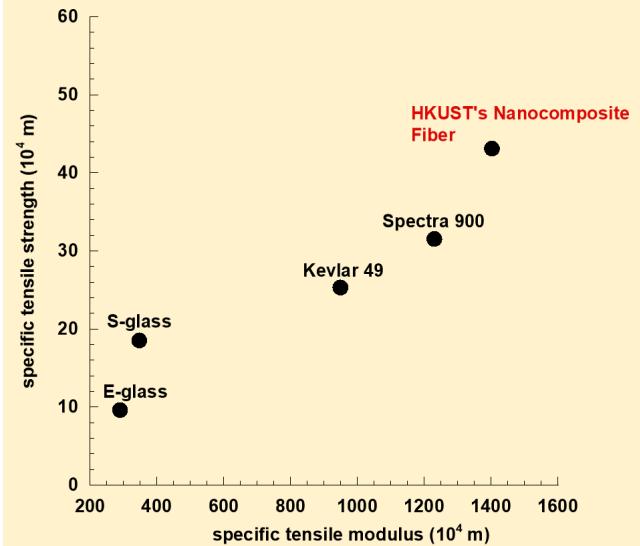
Research facility of the AMAT Thrust

- Green e Materials (GeM) Lab
- Quantum Science and Technology (QST) Lab
- Multifunctional Materials Lab
- Material Characterization and Processing Facility (MCPF)
- Center for Multifunctional Membrane
- Smart Wave Functional Materials Lab
-

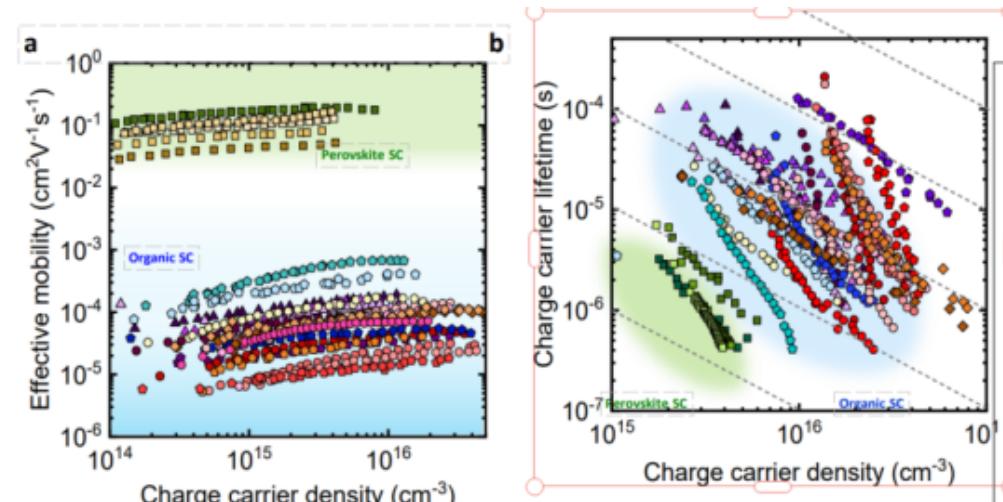


AMAT Research

Nanocomposite fibers



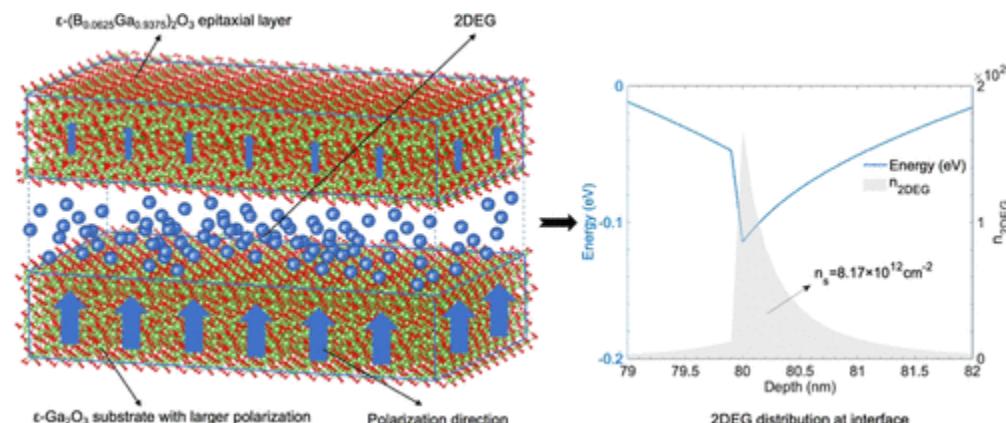
Solar Cells



strong polymer nanomembrane



nanometer-thick film



From AMAT faculty members' publications | 15

EOAS Thrust

- Atmospheric chemistry
- Air pollution and climate change interactions
- Climate science and atmospheric dynamics

- Cloud and aerosol process modeling
- Aerosol remote sensing
- Aerosol-weather and aerosol-climate interactions

Atmospheric Science

Oceanography

- Physical oceanography
- Biological oceanography
- Chemical oceanography
- Fishery oceanography
- Sea-air and land-sea interactions

Hydrology and Earth Surface Processes

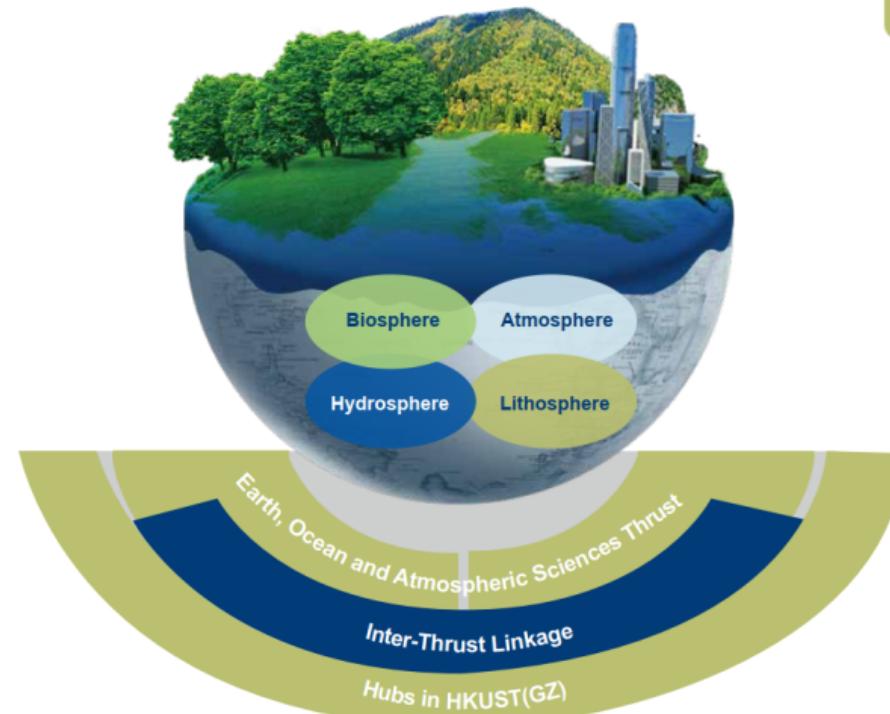
- Surface process and land-use modeling
- Water quality and management in surface and underground water
- Their physical, chemical, and biological processes

Earth and Urban System Science

- Earth and urban system observations and modeling
- Urban informatics
- In-situ and satellite remote sensing
- Human-environment interactions and sustainability

Climate Adaptation and Resilience

- Climate risk identification, assessment and modeling
- Ecosystem-based adaptation
- Water resources management and adaptation
- Climate-resilient health systems
- Climate-resilient agriculture and food systems
- Urban resilience



EOAS Research Facility

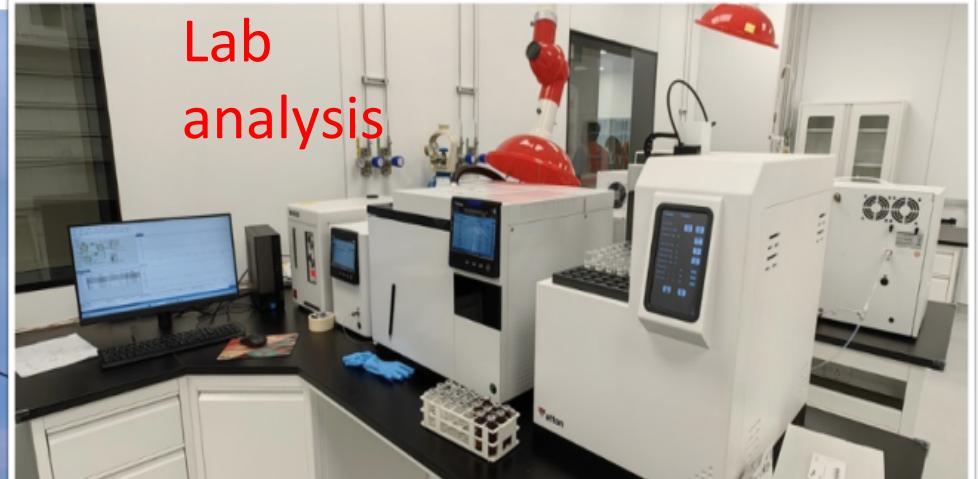
Field observation



Field survey



Lab analysis



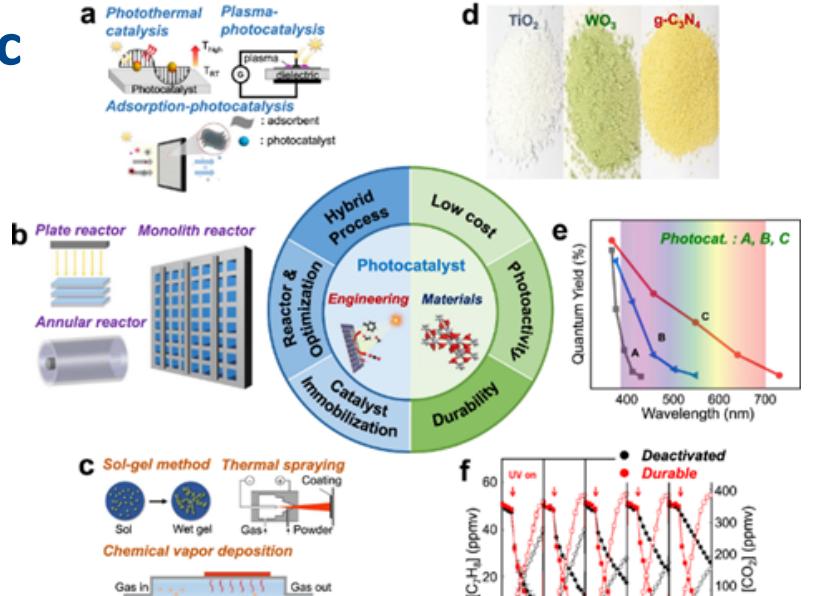
Numerical Modeling



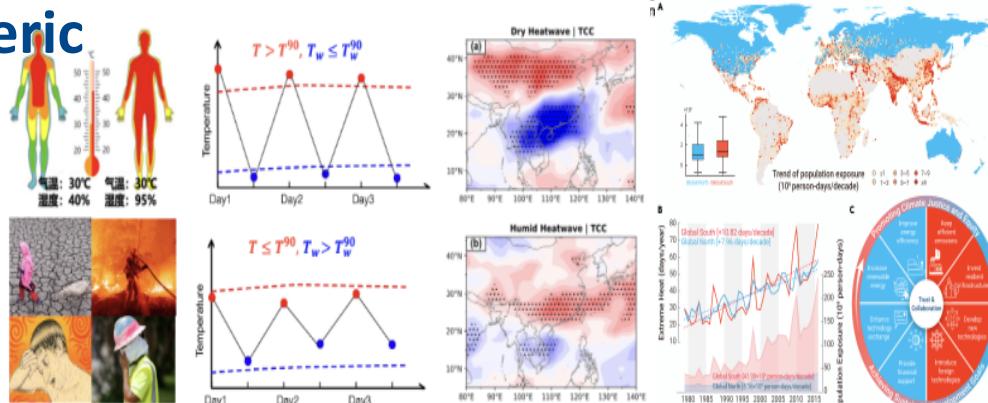
EOAS Research

Atmospheric Chemistry

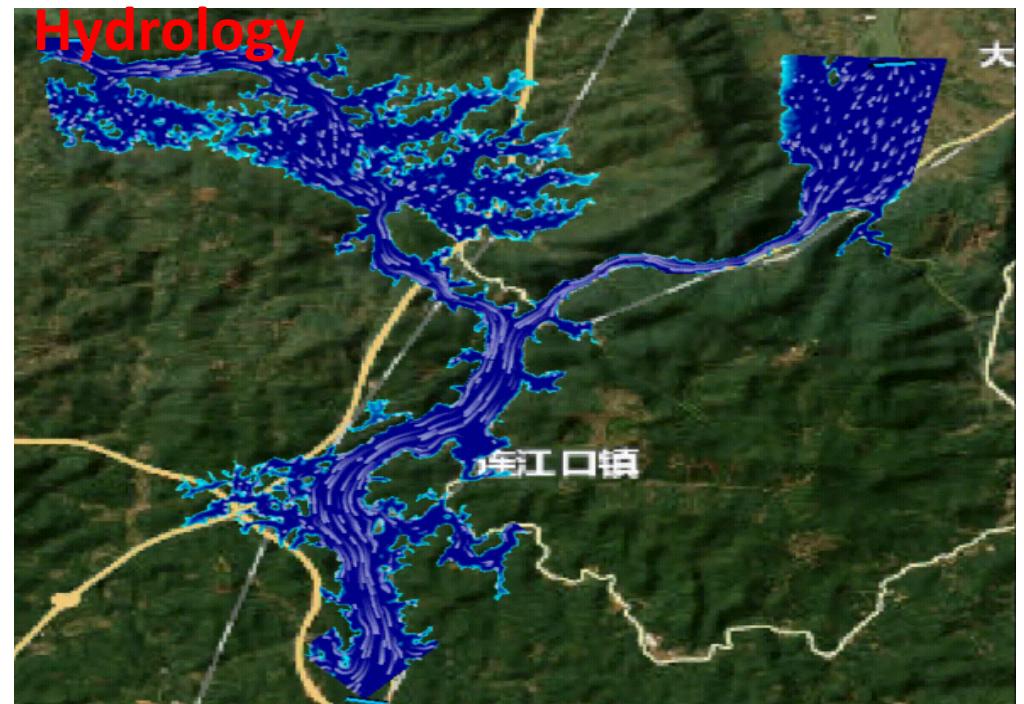
Factors considered for photocatalytic air purification



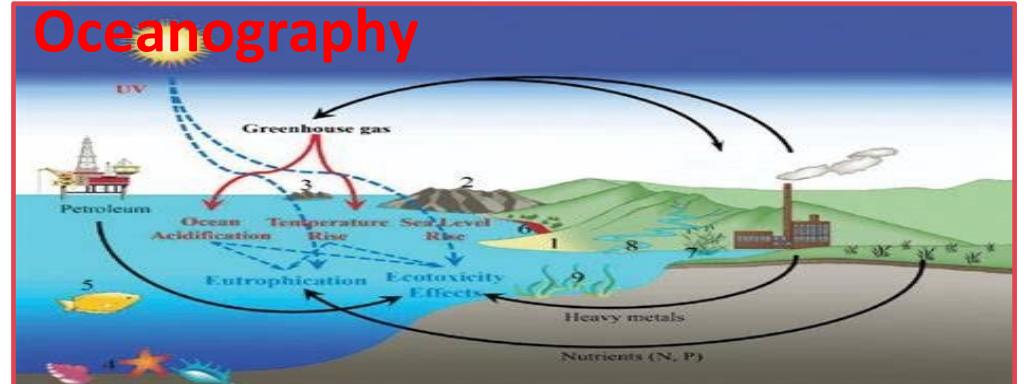
Atmospheric Physics



From EOAS faculty members' publications

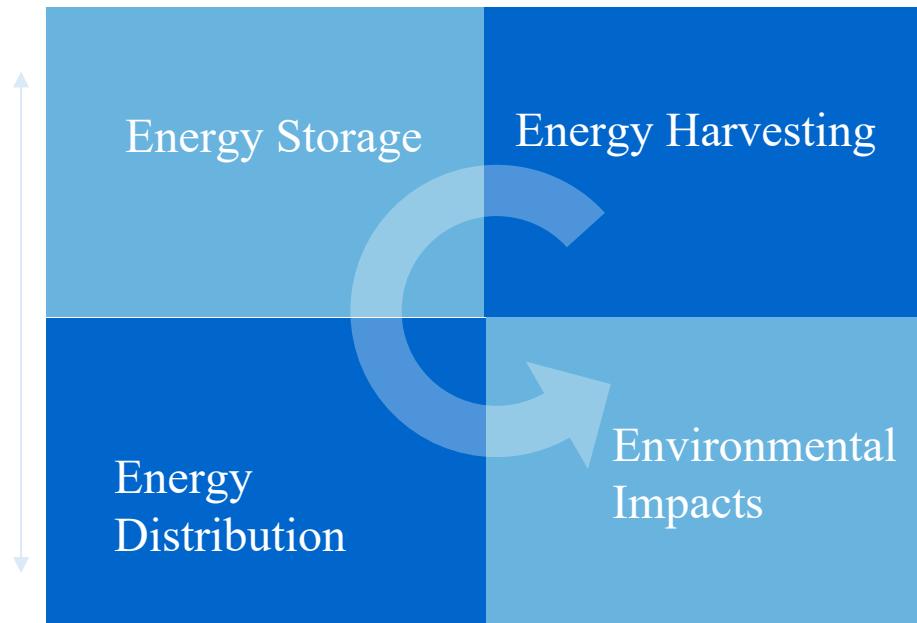


Oceanography



Research of the SEE Thrust

SEE: “To be a leading program in interdisciplinary education and research in sustainable energy and environment area”



Research facility of the SEE Thrust

- Brilliant Energy of Science and Technology lab (BEST)
- Bio-Inspired Engineering Research Facility
- Sustainable Atmospheric Environment Research Facility
- Atmospheric Environmental Risk Characterization and Management lab



Wind Tunnel



Fuel Cell Stack Test Platform



Air Quality Chamber

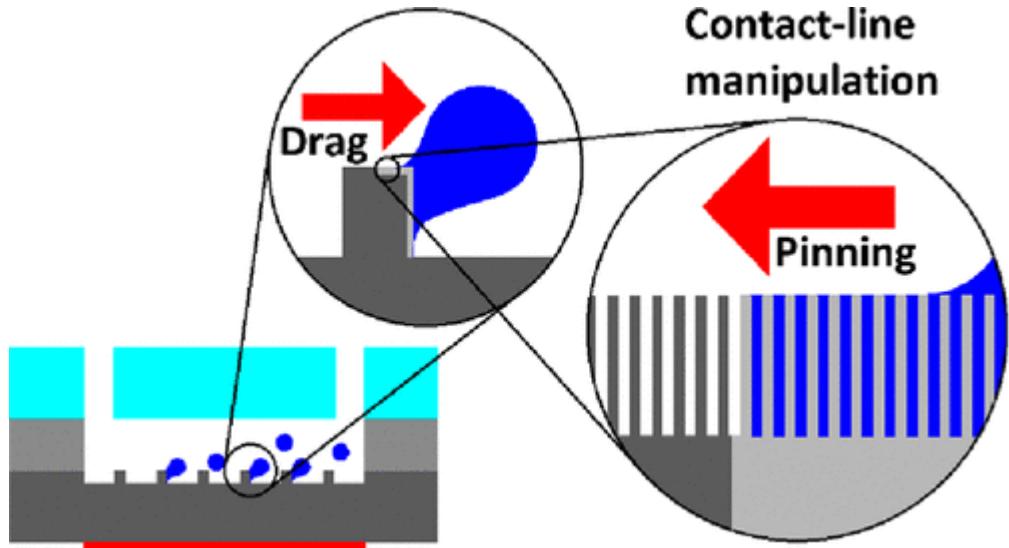


GCMS

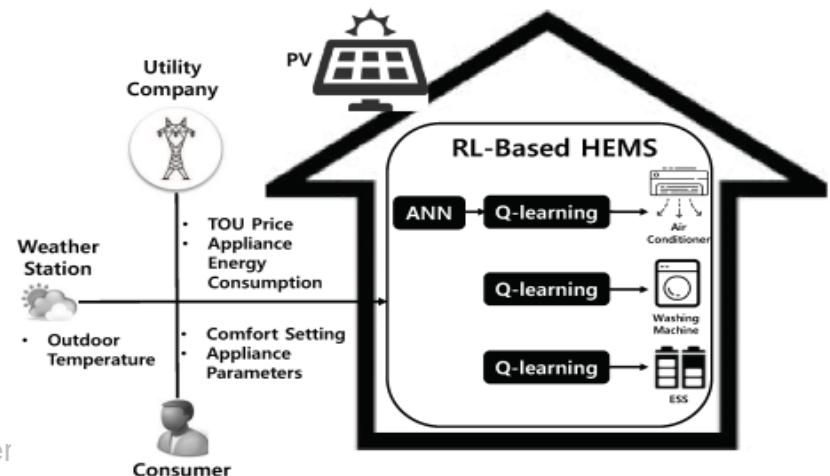
SEE Research

Fluid Dynamics and Heat Transfer

Contact-line manipulation



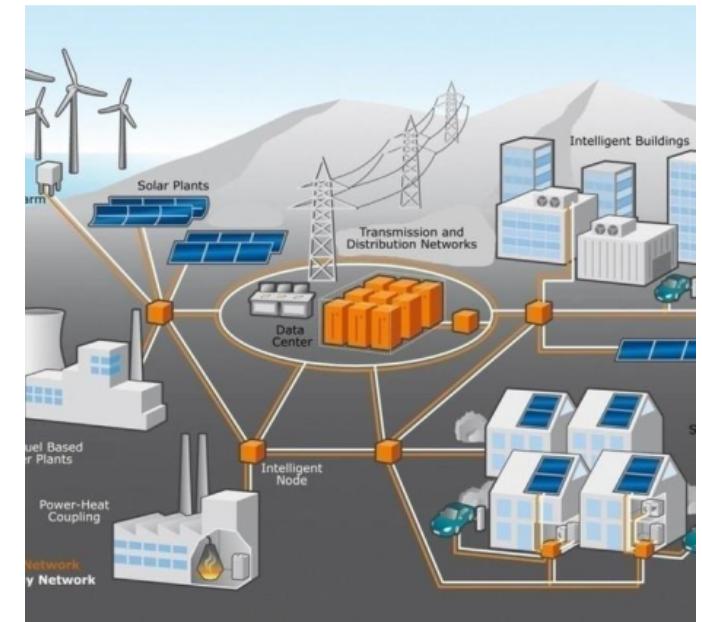
Green Building



High-Capacity Battery



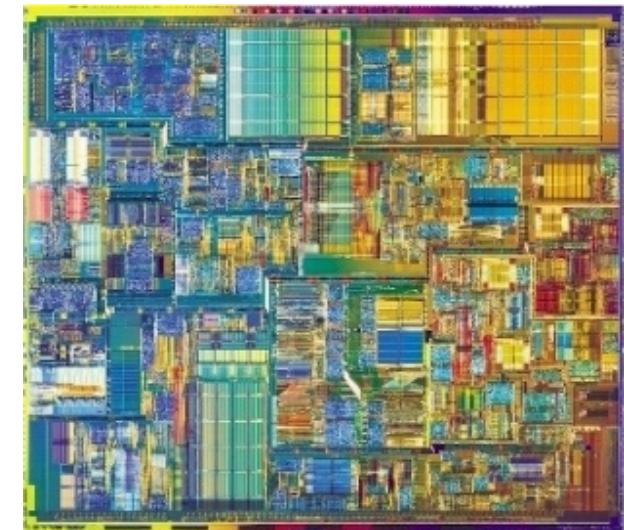
Energy transmission



Research of the MICS Thrust

MICS: “We offer fundamental trainings across different disciplines to prepare students to take on the challenge of the next century in the discovery and innovation of integrated circuits and systems”

- Device and Fabrication
- Circuits Technology
- Computer Architecture and System
- Electronic Design Automation



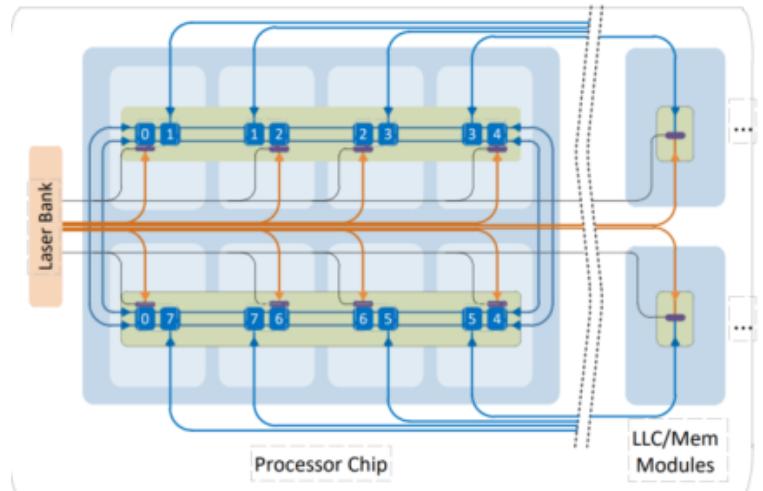
Research facility of the MICS Thrust

- Materials Characterization and Preparation Facility
- Nanosystem Fabrication Facility
- Novel IC Exploration Facility
- Center for EDA Research

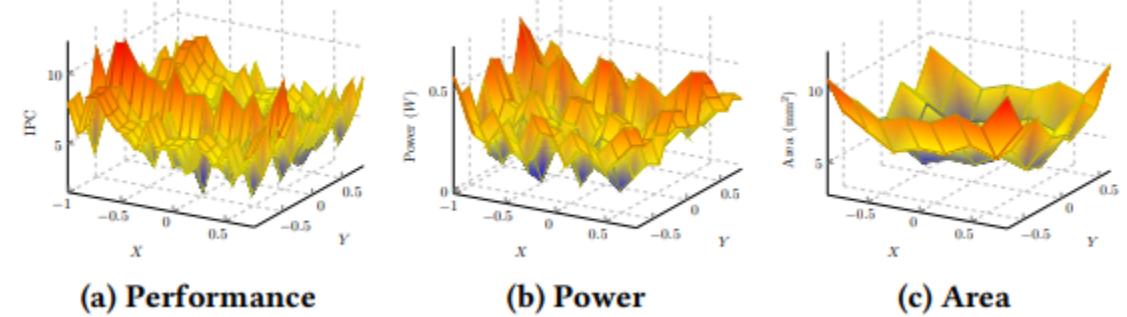


MICS Research

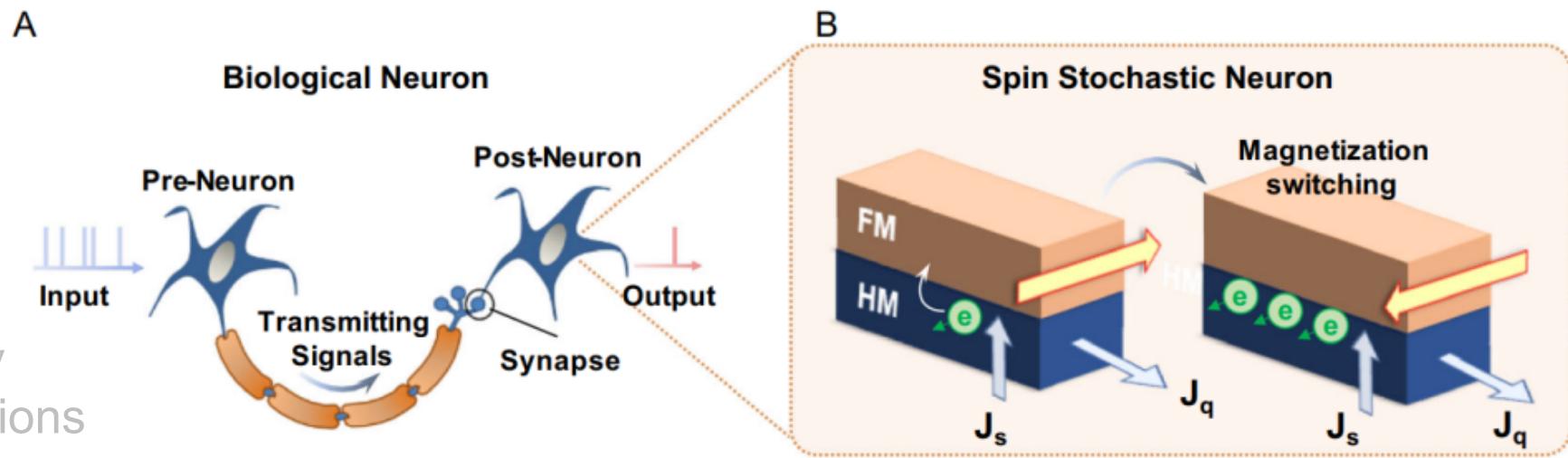
Photonic Chiplet



Microarchitecture



Brain-inspired computing



From MICS faculty
members' publications

Introduction to Function Hub For Sustainable Future

Course Introduction

Qichun Yang

2024-9-2

Course Description

- This course covers background knowledge in the thrust areas of the Function Hub, including Advanced Materials, Sustainable Energy and Environment, Microelectronics, and Earth, Ocean and Atmospheric Sciences.
- Students will learn about the overall academic structure of HKUST-GZ and the role Function Hub plays in supporting the academic goal of HKUST-GZ.
- Students will also learn about how the 4 Function Hub Thrusts interact with each other, in addressing challenges facing our society.

Course Objectives

- Help students understand fundamentals of material science
- Enrich students' knowledge of the interplays between human activities (Energy consumption, GHG emission) and the environment (Climate change, air quality, and pollutions)
- Develop students' creative thinking skills to conduct interdisciplinary research.
- Broaden students' horizons in applying state-of-the-art technologies in solving environmental problems

Rules for Setting the Lectures

- Lectures will be aligned with course objectives
- With coherency among the lectures
- Will be representative of Function Hub research
- Will be balanced among the 4 Thrusts in terms of the lecture contents
- With reasonable depth and breadth

Lecture Topics

Fundamentals
of the physical world

Environmental challenge

Solutions for sustainable development

- The history of material science and human civilization (**AMAT**)
- Polymers (**AMAT**)
- Graphene/AI Matter in Advanced Materials (**AMAT/SEE**)

- Climate change (**EOAS**)
- Hydrology and climate change (**EOAS**)
- Responses of Oceans to climate change (**EOAS**)

- Renewable energy production (**SEE**)
- Green Building (**SEE**)
- Electric Vehicles (**SEE/ AMAT**)

- Development of computers (**MICS**)
- Chip production from sand (**MICS**)
- Supercomputing (**MICS/EOAS**)

12 lectures in total

Course Assessment

- 4 essays, fore each of the 4 modules
 - Essay 1 will be for material science (25%), topic will be given after **lecture 2**
 - Essay 2 will be related to earth science (25%), topic will be given after **lecture 5**
 - Essay 3 will be about Energy (25%), topic will be given after **lecture 8**
 - Essay 4 will be for MICS (25%), topic will be given after **lecture 11**

Deadlines for course tasks

Essay 1	Sep 29 th , Sunday
Essay 2	Oct 27 th , Sunday
Essay 3	Nov 17 th , Sunday
Essay 4	Dec 8 th , Sunday

Essays

- ≥ 750 words
- Cheating or plagiarism in any form will NOT be allowed.
- Students are allowed to use artificial intelligence (AI) tools (e.g., ChatGPT) to enhance their learning experience and course performance.
- But copying the contents generated by AI tools **directly** is not allowed.
- Students must provide a statement briefly describing how the AI tool(s) was used, including the exact **prompts** used and the rationale for the choices made. **Screenshots of** the prompts and outputs should also be attached.

Attendance

- Students are encouraged to attend all lectures **offline**.
- Students will be **randomly** selected to answer questions at the end of each lecture, after Sep 14th.
- Requests of leave for any lecture need to be sent to the instructor or TA **before** the lecture. The requests need to be well justified.
- Absence without leave will lead to a reduction of **15** points from the course grade.

Teaching Group

- **Qichun Yang:** (W4 317, qichunyang@hkust-gz.edu.cn, 020-88332801)
Office hour: Monday, Tuesday, Thursday, and Friday **15:00-16:00** or by appointment
- **Wentao Pan:** (wpan081@connect.hkust-gz.edu.cn)
Office hour: Thursday **15:00-16:00**
- **Zeju Zheng:** (zzheng368@connect.hkust-gz.edu.cn)
Office hour: Wednesday **10:00-11:00**

2024-25 Fall

[Home](#)[Announcements](#)[Assignments](#)[Discussions](#)[Grades](#)[People](#)[Pages](#)[Files](#)[Syllabus](#)[Outcomes](#)[Rubrics](#)[Quizzes](#)[Modules](#)[BigBlueButton](#)[Collaborations](#)[New Analytics](#)[Item Banks](#)[Chat](#)[Attendance](#)[Collapse All](#)[View Progress](#)[Publish All](#)[+ Module](#)[Syllabus](#)[FUNH5000_syllabus_section1.docx](#)[Lecture files](#)[Drop files here to add to module](#)[or choose files](#)

- Assignments
- Discussions
- Grades
- People
- Pages 
- Files
- Syllabus
- Outcomes 
- Rubrics
- Quizzes 
- Modules
- BigBlueButton
- Collaborations
- New Analytics
- Item Banks
- Chat
- Attendance
- Studio
- Zoom

For improved security the Approved Domains section of the LTI Pro configuration page needs to be configured 

Redirect to Zoom...

If you can not launch LTI Pro, please [click here](#).

[Upcoming Meetings](#)[Previous Meetings](#)[Personal Meeting Room](#)[Cloud Recordings](#) Show my course meetings only

Start Time

Topic

Meeting ID

Today (Recurring)
9:00 AM[FUNH5000 \(L01\) - Introduction to Function Hub for Sustainable Future](#)

917 3337 9840

[Start](#)[Delete](#)Mon, Sep 9 (Recurring)
9:00 AM[FUNH5000 \(L01\) - Introduction to Function Hub for Sustainable Future](#)

917 3337 9840

[Delete](#)Mon, Sep 16 (Recurring)
9:00 AM[FUNH5000 \(L01\) - Introduction to Function Hub for Sustainable Future](#)

917 3337 9840

[Delete](#)