ASIAN ENGINEERING DEANS' SUMMIT 2024
Disruptive Innovation in Engineering Education and Research

The Asian Engineering Deans' Summit (AEDS) was 'created in 2011 to bring together Engineering Deans in Asian and Pacific cities and leverage their collective strengths for the advancement of engineering education, research, and service to the Asian–Pacific community'. It was 'inspired by the founding of the International Federation of Engineering Education Societies (IFEES) in 2006 and Global Engineering Deans Council (GEDC) in 2008'.

The 11th AEDS was organised during 21–22 May 2024 at the Indian Institute of Science (IISc), Bengaluru. The two-day programme schedule was rich with 22 talks, 2 panel discussions, and 4 facility visits, attended by a total of 45 participants. Welcoming the participants, *Rajesh Sundaresan* (Dean, Division of Electrical, Electronics, and Computer Sciences, IISc and Chair, Local Organising Committee for the 2024 Summit) said that the event has been sponsored by the Ministry of Education, Government of India, through the Institution of Eminence (IoE) scheme.

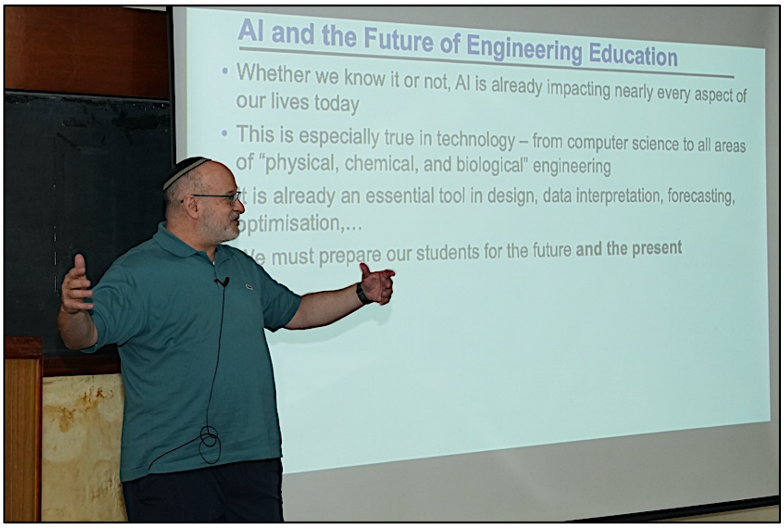
IISc has been recognised as an IoE since 2016. Describing this Institute of Science, *Govindan Rangarajan* (Director, IISc) revealed that there are more engineering faculty in IISc than science faculty. With the upcoming Medical School and the Bagchi—Parthasarathy Hospital, a new Division of Medical Sciences will be added to the existing six Divisions at IISc and a new vertical of 'Medicine' in addition to 'Science' and 'Engineering'. "A network of Deans would be very useful going forward", said the Director.

Speaking of the AEDS Summits, *David J Srolovitz* (Chair, Steering Committee for the 2024 Summit and Dean, Faculty of Engineering, The University of Hong Kong) highlighted their importance in addressing engineering education and research challenges and fostering interactions between institutions across the Asia–Pacific region.

The theme for this year's Summit was 'disruptive innovation in engineering education and research'. What is the need to introduce disruptive innovations? What changes are required in the existing undergraduate (UG) engineering curriculum? What is the downside to introducing such changes? How do we cultivate an entrepreneurial mindset among students? What is engineering temper? These were some questions discussed by the Deans and Heads of Institutions present.

With the advent of Industry 4.0 and smart manufacturing incorporating technologies such as Internet of Things (IoT), cloud computing, artificial intelligence (AI) and machine learning (ML), the expectations from engineering graduates have changed. Their employability also seems to depend on a wide range of non-technical skills such as creativity, critical thinking, problem-solving ability, teamwork, entrepreneurial mindset, and communication.

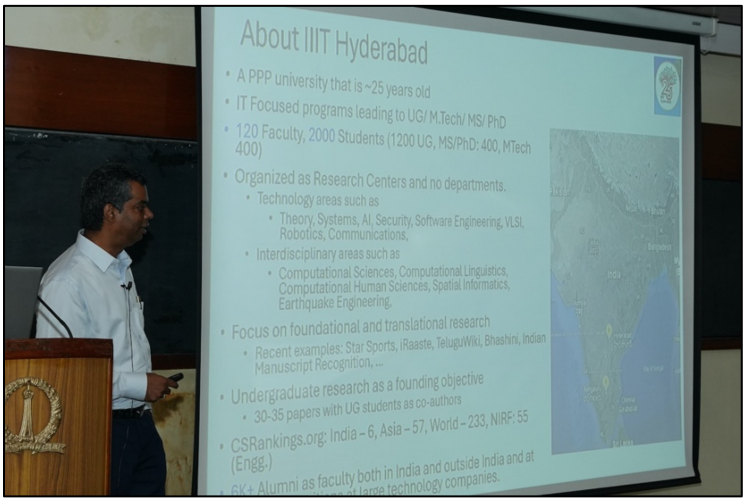
"Since it's already being used in industry, and its use in the industry is growing so rapidly, our responsibility to our students is to make sure they are up to date with the tools of the trade", said *David J Srolovitz* in his talk on integrating AI into undergraduate engineering education.



He pointed out, "We've always been afraid of new tools; yet, we must embrace them". Students have to be encouraged to explore, experiment, and build experience in using these tools. The use of AI can be encouraged in the classroom through, for example, the use of large language models in every assignment with the student declaring which model was implemented and which prompts were used. A typical AI module in a first-year programming class can include (i) introduction to AI concepts, (ii) machine learning, (iii) data handling and ANN (artificial neural network) training, (iv) AI in practice, (v) hands-on experience, (vi) challenges in applying AI, and (vii) prompt engineering. According to Srolovitz, the biggest challenge in integrating AI into the curriculum are the professors, as they have not grown up in the AI age and do not pick up compute technology as quickly as the students. Hands-on training workshops for professors can be conducted to enhance their understanding of AI and how to use it in the engineering classroom.

Another introduction required in the undergraduate curriculum is interdisciplinary courses. To break the barrier of disciplines, courses have to be reviewed and restructured, said *Mao Hsiung Chiang* (Dean, College of Engineering, National Taiwan University (NTU)). The University offers 251 specialisation programmes and interdisciplinary Bachelor's programmes at the college and university levels. The Intelligent Engineering and Technology UG programme curriculum focusses on basic sciences, materials science, device physics, semiconductors, information technology, electronic circuits, and semiconductor manufactuting. To internationalise education, the medium of instruction in all the graduate and two undergraduate programmes is English. There is also an emphasis on 'learning by doing' in the capstone courses offered ; in mechanical engineering (2022), this involved the development of an autonomous air-driven car.

'Learning by doing' is also the focus in the UG curriculum at the International Institute of Information Technology Hyderabad (IIITH). *Kishore Kothapalli* (Dean (Academics), IIITH) described their practice–theory–practice philosophy that includes workshop style courses early on in the programme. In



addition to traditional research, the focus is on foundational and translational research.

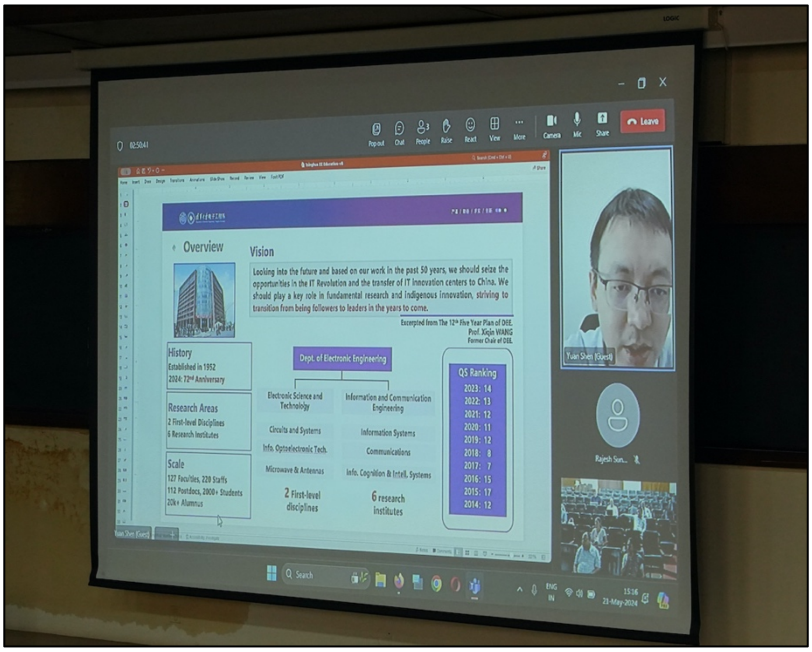
To 'remove the fear of doing things', discipline courses are offered in the first two years instead of the traditional physics, chemistry, and mathematics courses. A flexi-core lets students move around courses to other semesters. Research awards are given to students who produce research outcomes beyond their programme requirement.

Integrating 'learning by doing' requires (i) a curriculum design that offers a lot of flexibility; (ii) curriculum operation that promotes and encourages wide choice; (iii) academic scheduling that gives space for self- and peer-learning (there are no classes scheduled for Wednesday and Saturday afternoons); and (iv) support for project execution, auxiliary infrastructure, and activities that accentuate associated skills. Support is given for auxiliary activities such as poster presentations and hackathons. The evaluations models are flexible. The outcomes include (i) students with better problem-solving skills especially with respect to unstructured problems; (ii) students geared towards UG research; (iii) usable artefacts from course projects; (iv) good proportion of students earning graduation requirements via projects/independent study credits; and (v) naturally-enhanced soft skills.

The challenges involved in such a curriculum are with regard to (i) scaling activities to large elective classes; (ii) blending changes in discipline to changes in curriculum; (iii) flexibility in evaluations versus timelines; and (iv) keeping facilities open round the clock.

An organic curriculum was prescribed by *Rupesh Vasani* (Director, SAL Education Campus) – one that develops naturally according to contemporary knowledge needs and current issues; one that focuses on the holistic development of the student. The structure of such a curriculum would be flexible and non-conventional with a convergence of disciplines, with industry partnership, and global in nature; the delivery would be through immersive experiential learning using futuristic learning spaces and technologies and 21st century modes; and the assessment would be authentic, performance-based, challenge-based, real time, contemporary, integrated, and personalised.

Vasani also explained micro credential, which is a digital/non digital certification of assessed knowledge, skills, and competencies in a specific area or field that can be a component of academic programmes or standalone courses supporting the professional, academic, and personal development of the learners. This is seen as a step towards vocationalising university programmes and bring in challenges including a lack of institutional flexibility and resistance to change and a lack of employer understanding of the value of digital credentialing.



Yuan Shen (Professor and Council Director, Department of Electronic Engineering, Tsinghua University) spoke about strengthening industrial and global perspectives in their UG programme in electronic engineering.

The steps taken to cultivate high-quality, multidisciplinary talents with global vision capable of addressing global challenges, the technological revolution, and the industrial transformation are through (i) promoting UG exchange programmes, joint training programmes, and SDG (sustainable development goals) courses; (ii) promoting the internationalisation of education and research, and enhancing the global competency of students; (iii) using forums and overseas bases to create friend zones overseas; and (iv) promoting the development of electronic and information engineering disciplines and enhancing the international influence. Students are encouraged to create (e.g. the voice-controlled ping pong training robot) and take part in competitions (e.g. Cloud Innovation Competition).

Chi-Sheng Shih (Associate Dean of International Affairs, College of EECS, National Taiwan University) described how they have converted their research outcomes into the curriculum for autonomous systems. The specialised course on 'Connected and Autonomous Driving Systems' aims to train students to become the R&D (research and development) talents needed by the future networked intelligent driving system industry. The module includes (i) foundational courses (system programming), (ii) theory and methodology (operating systems), (iii) application and projects (introduction to intelligent vehicles), and (iv) capstone (autonomous middleware). The curriculum starts with 'virtual and simple' to 'physical and complex'. Shih also introduced the Autoware Center of Excellence Network, the mission of which is to make autoware easy and efficient for new users to adopt and new contributors to contribute.

Hoe Joon Kim (Associate Vice President of International Affairs, Daegu Gyeongbuk Institute of Science and Technology (DGIST)) spoke about convergence engineering education and student-centred learning. The Institute's education philosophy emphasises the practical relevance of knowledge, focussing on its relevance to real-world problems. The Institute prepares students to thrive in a globalised world through international collaboration, exchange programmes, and a culturally diverse student body. The project-based learning approach enables students to tackle complex problems through hands-on projects and research and cultivates critical thinking, problem-solving skills, and collaboration.

The Institute does not have UG majors. A flexible curriculum allows students the freedom to choose from a diverse range of courses and research opportunities, enabling personalised learning opportunities. However, this flexibility could be chaotic and difficult for students who are not proactive and shy and need a clear order or direction; some students also use this system to minimise the workload and earn minimum credits; to tackle this problem, many faculty–student meetings are held.

In the absence of specific department demarcations, students may also have difficulty in choosing an area when applying for jobs and hence, a 'track system' has been introduced in which half the credits are for traditional majors. At the postgraduate level, department specifications are required to obtain government funding and for recruiting external students. Also, having experienced freedom at the UG level, students request for something similar at the PG level. To address this, interdisciplinary studies has been introduced.

Interdisciplinarity and project-based learning is also the emphasis at Plaksha University, as described by *Nandini Kannan* (Dean (Academics), Plaksha University). The University offers four interdisciplinary majors (BTech) in Computer Science and Artificial Intelligence, Robotics and Cyber-Physical Systems, Biological Systems Engineering, and Data Science, Economics and Business.

In semesters 1–3 (Plaksha Freshmore), students take courses that introduce key engineering tools and principles and helps develop an interdisciplinary mindset. Core major courses are offered during semesters 4–6, and advanced electives and capstone during semesters 7–8. Students choose their major at the end of semester 3. Instead of the traditional Physics 1 and Physics 2, students take 'Foundations of Physical World' in semester 1. The 'Nature's Machines' course offered in semester 2 describes various organ systems in human physiology, with special attention to biological transport and reactions in pulmonary and cardiovascular systems; it touches on plant physiology and highlights the important molecular interactions involved in the key biochemical processes in plants; and covers the role of nature's machines in addressing environmental challenges by showcasing the example of bioremediation of wastewater.

The Innovation Lab and Grand Challenges Studio enable a unique project-based learning experience across semesters. Communication skills are integrated into the curriculum. The 'Machine Learning and Communication' project is assessed based on the technical merit and the ability to communicate results effectively to different audiences. Some other focus areas to enhance the student experience are mentoring, extra-curricular activities, life skills courses, and open lines of communication between students and faculty.

Divya Nalla (Director, Nalla Malla Reddy Engineering College) spoke about the status of curriculum components and the current requirements of artificial intelligence, machine learning, and data collection mechanisms. There is also a need for inculcating social consciousness and ethical values, sustainability and climate change education, and the learning of language and its usage. This implementation can be done through addressing the way the courses are taught and the kind of assessment models used. Nalla explained the teaching–learning processes/models being implemented in her College and the alternate assessment methods used.

"Young engineers must be prepared to work at the intersections of their own disciplines and for some specific situations involving electronics, computer science, artificial intelligence, mathematics, the subjects of life sciences", said *Gautam Biswas* (former Director, Indian Institute of Technology (IIT) Guwahati; currently, Professor and J C Bose National Fellow, IIT Kanpur) who gave a detailed design for the UG curriculum. Through technological developments and the way society is progressing, new subjects such as data and image analysis, telemetry, bioinformatics, and real time *in vivo* sensors are developing and becoming indispensable.

The current trend world over is to structure the academic programmes in a credit-based academic system. Biswas put forth the prevailing thoughts on the division of credits in many well-known schools. He indicated that modular courses are preferred for wider exposure; such courses include AI for humanity, systems biology, and deep learning. He also pointed out that "elective courses develop the special talents of the individual students to serve the varied needs of society and to take advantage of interdisciplinary developments" and that a project work had to be introduced to expose engineering students to end-to-end solutions. He stressed on early introduction to research in the areas of national need.

The Japanese Government selected Tohoku University as the sole candidate for certification under the International Excellent Research University programme in Japan. The goal of the new programme was for students to contribute to new industries and for the university to contribute to society, to obtain research funding, and to collaborate with other global universities and organisations. *So Kazama* (Professor, Tohoku University) spoke about the new cross information programme initiated by his University, the Green x Digital graduate programme, AI and Electronics graduate programme, and Data Science graduate programme.

'Interdisciplinarity in Engineering Education' was the topic of *Sushma Kulkarni*'s (Vice Chancellor, NICMAR University) talk. She spoke of interdisciplianrity as an approach that integrates knowledge, methodologies, and perspectives from multiple disciplines within the field of engineering as well as from other related fields such as sciences, social sciences, and the humanities. The interdisciplinary skills required of engineers are critical thinking, problem solving, communication, adaptability, and collaboration. Interdisciplinarity can be implemented in the curriculum through integrated courses and projects, collaborative learning environments, flexible degree programmes, interdisciplinary research opportunities, and faculty development. At NICMAR, techno managers are developed through an MBA programme that focuses on 60% technical expertise, 30% managerial skills, and 10% strategic awareness.

Pardeep Kumar (Pro-Vice Chancellor, Manav Rachna International Institute of Research and Studies) elaborated on the principles of design thinking and its benefits. Here, the learning objectives are to (i) understand the fundamentals of design thinking and how this can be used to solve real-world business problems; (ii) learn about the five stages involved in design thinking and how to find a solution using them; (iii) develop user empathy and use it as a tool to discover real user needs; (iv) analyse the structured approach to brainstorming and ideation to create parallel possibilities; and (v) create a minimum viable product.

To promote the creation of startups and innovation projects leading to national/international competitions/patents/prototype development, the steps taken are as follows: (i) students propose their project/startup idea to their department; (ii) projects are individual or group-based, and a multidisciplinary approach is encouraged; (iii) the Innovation and Incubation Centre (IIC) reviews proposals and sets progress timelines; (iv) IIC provides mentorship and monitors progress through monthly reports/demonstrations; (v) relaxation is given in attendance/extra credits depends on achievements in competitions and project development; (vi) a review committee awards grades and may recommend further benefits.

Many initiatives have been taken by the All India Council for Technical Education (AICTE) to move away from memory-based courses and examinations. *T G Sitharam* (former Director, IIT Guwahati; currently, Chairman, AICTE) stressed on the need for equipping UG students with the appropriate skills to ensure better employability. Some of the transformative initiatives by AICTE include (i) revision of curriculum, (ii) shifting focus from cognitive to non-cognitive skills, (iii) internationalisation of higher education, (iv) software and hardware hackathons (e.g. Smart India Hackathon), (v) teacher training and faculty development programmes, (vi) mandatory internships, and (vii) promoting innovation and startups. The key principles of the National Education Policy 2020 include a respect for diversity and local content, equity and inclusion, community participation, use of technology, emphasising conceptual understanding, unique capabilities, critical thinking and creativity, and continuous review.

A two-year MBA programme has been introduced, at the end of which the student has to start a startup. Design thinking is introduced in the Class 6 NCERT textbook. Sitharam touched upon many other initiatives such as the National Credit Framework, establishing a digital and technology enabled education system, creation of an academic bank of credits, and preparation of open courseware. To transform the teaching–learning process, experiential learning (focus on experiential, inquiry and discovery-based teaching –learning methods), integrated pedagogy (arts, sports, story-telling, and information and communications technology (ICT)-integrated pedagogy), promotion of peer tutoring (as a voluntary and joyful activity under the supervision of teachers), equal weightage (to curricular, co-curricular, and extracurricular areas), and the use and integration of technology are focussed on.

For an outcome-based education, we need to ask the following questions: (i) what do we want students to know and to be able to do? (ii) how will we know that they can do it? (iii) what resources must be available to ensure that all students succeed? (iv) how do we structure and pace an instructional programme that prepares all students to perform well?

Ashok Misra (former Director, IIT Bombay; currently, NASI Distinguished Professor, IISc) talked about how research, innovation, and entrepreneurship should be inculcated in engineering education. Some of the points he highlighted are: (i) an ambience for creativity, inventions, and innovations has to be created; (ii) cross-disciplinary interactions with other fields such as economics, business administration, finance, law, and entrepreneurship must be developed; (iii) public policy should be given importance to in several areas; (iv) industries should become active partners with higher education institutions and economic growth; (v) industry has to fund fundamental and applied research relevant to development of the country; (vi) intellectual property has to be created through development of new ideas, inventions, and innovations; (vii) research has to be brought in even at the Masters and Bachelors level; (viii) clusters can be made in different areas of science and technology; (ix) innovation and tinkering labs need to be established; (x) technology festivals, ideas competitions, and technology business competitions can be held; and ix) business exposure and IPR (intellectual property rights) awareness have to be provided for faculty, researchers, and students.

Tarun Gupta (Dean (Research and Development, IIT Kanpur) spoke about the need for wider dissemination of IPR knowledge among students and faculty. He explained the rationale for encouraging innovations and its inclusion in the policy framework of his Institute, which ranks number 1 in the NIRF (National Institutional Ranking Framework) Innovation ranking. Two of their accomplishments through innovations are the first portable soil testing device *'Bhu-Parikshak*' and the Haptic smart watch for the blind and visually impaired. One of the deep tech innovations is the 5G radio access network (RAN) technology jointly developed by IIT Kanpur, IIT Madras, and SAMEER. Mission Bharat O_2 was an initiative that aimed to support the pan India production of indigenous oxygen concentrators and oxygen plants. A high-end and affordable ICU ventilator was developed in just 90 days during the first wave of COVID-19; 3000 ventilators were installed, 9000 professionals were trained, and an estimated 50,000 lives were saved.

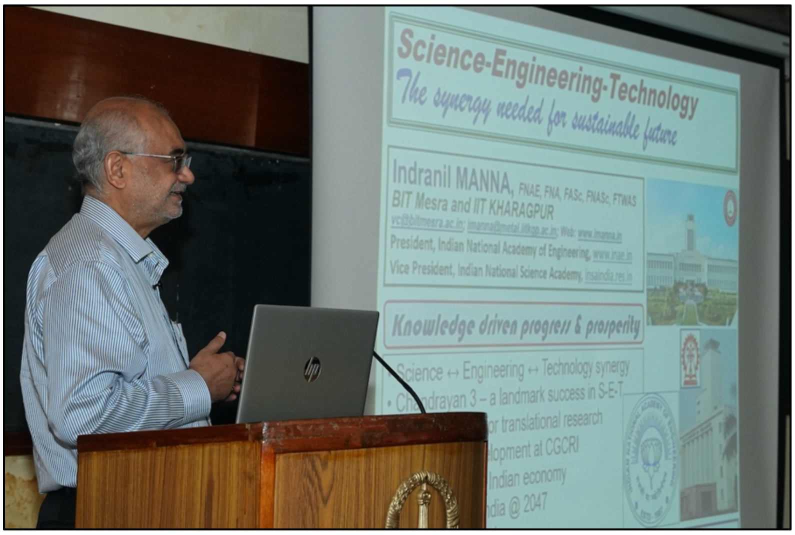
Rohit Kandakatla (Director, K G Reddy College of Engineering) spoke about service learning as a great educational philosophy and tool to help engineering institutions build regional and local relevance in nearby communities with a goal to co-exist and work towards their socio-economic development. Service learning can be defined as a credit-bearing educational experience in which students participate in an organised service activity that meets identified community needs and reflects on the service activity in such a way as to gain further understanding of the course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility. The integration of community-based problems can be done in the engineering curriculum. Service learning also aligns with the National Education Policy 2020.

Kandakatla gave a case study for service learning in engineering through the *Unnat Bharat Abhiyan* programme in India. The objectives of this programme are to (i) engage the faculty and students of higher educational institutions in understanding rural realities; (ii) identify and select existing innovative technologies, enable customisation of technologies, or devise implementation methods for innovative solutions, as per the local needs; and (iii) leverage the knowledge base of the educational institutions for effective implementation of various government programmes. As part of this programme, students at this College developed innovative solutions such as a low-cost automatic incense stick making machine that converts waste flowers into incense sticks in Sriram Nagar village and a post-harvest preservation ecosystem for horticultural crops and flowers in Surangal village.

Chun Kit Chui (Director, Tam Wing Fan Innovation Wing, Faculty of Engineering, The University of Hong Kong (HKU)) also spoke about service learning in addition to interdisciplinary and experiential learning. The aim of the Innovation Wing is to unleash the creative potential of students by entrusting them with the responsibility to spearhead innovation and technology projects that will shape the future.

Chui described the journey of establishing and operating this Wing. The design of the space includes (i) social space (brainstorming area, wall of achievements, and a social media sharing platform); (ii) makerspace (prototyping and digital facilities); (iii) activity space (brainstorming area, open event area, and event hall/project studio); (iv) resource hub (equipment and consumables, members, academic advising, technical support, workspace, and funding schemes); and (v) thematic workshops.

Student-initiated courses are organised that provide an opportunity for students to design, develop, and teach a course on a technology-related topic. Workshops are organised to facilitate hands-on experiences, creating opportunities for active exchange and learning about advanced technologies. Pitching events are organised for students to present project ideas and find potential team members. The InnoHub programme connects students and academic staff from 10 faculties at HKU for cross-disciplinary collaboration in the Innovation Wing. Engineering InnoShow is organised at the end of every semester for students to showcase and celebrate the outcome of their learning and creation.



"For society to prosper, we need a synergy between science, engineering, and technology", said *Indranil Manna* (Vice Chancellor, Birla Institute of Technology Mesra). While science addresses the fundamental question of 'Why?', engineering deals with 'How?' and Technology with 'What sells?'. The Chandrayaan-3 mission was possible due to this synergy. The modern innovation ecosystem comprises of academia creating and disseminating knowledge, research organisations pursuing invention, industry producing/providing innovative solutions as viable technology, and society consuming and demanding these solutions. Manna also spoke about the IMPRINT (IMPacting Research, INnovation and Technology programme that was launched in 2015 in India with the aim of inclusive growth and self-reliance by translation of knowledge into viable technology.

Dheepa Srinivasan (Dean (Research & Innovation), Ramaiah University of Applied Sciences) spoke about the science–engineering–technology synergy that happens at her University and the external collaborations that have led to many patents; two of the translational technologies are the bionic arm and a device, system, and apparatus for female urine collection. She also bought forth her experiences when working previously for General Electric and described a template that she had used for industry–academia partnership in research and innovation. She showcased four case studies where the ideation, prototyping, and production were all done in India in a short time frame with industry–academic partnership and student interns. She pointed out that different processes in a project can be carried out in tandem if the academic faculty and industry partners are clear about their individual contributions.

"Engineering education does not teach students/researchers how to create value", said *Ajay Sethi* (Venture Advisor, Accel India). To create value, researchers need to move from invention to innovation, and to commercialise, they need an entrepreneurial mindset. Such a mindset would be the result of an understanding of the need to innovate in the presence of three constraints, namely (i) users (understand target users and their pain points); (ii) value delivery (build products to deliver value to users and alleviate their pain points); and (iii) business (build commercially viable business).

Can entrepreneurial mindset be taught? Sethi says that though a lot of the entrepreneurship journey is experiential (and therefore, needs to be learnt), this mindset can be taught in a structured and scientific manner, with an open-ended approach and just-in-time content. He gave examples of such programmes at ARTPARK, IISc and IIT Bombay.

What is engineering temper? "Why is it that we talk about scientific temper but not engineering temper?", asked *G K Ananthasuresh* (Dean, Division of Mechanical Sciences, IISc).

Temper can be defined as a state of mind, mood, habitual way of thinking, behaving, or acting. Scientific temper has been defined and according to Jawaharlal Nehru, "Science deals with the domain of positive knowledge but the temper which it should produce goes beyond that domain". Nehru also speaks about four facets of the scientific temper, namely, (i) the search for truth and new knowledge, (ii) the refusal to accept anything without testing and trial, (iii) the capacity to change previous conclusions in the face of new evidence, and (iv) the reliance on observed fact and not pre-conceived theory. The corresponding facets in engineering temper, according to the speaker, are (i) disquiet about inadequacies that can be improved, (ii) fortitude to solve problems by finding viable solutions, (iii) ability to apply and extend scientific concepts, and (iv) reliance on one's endeavours and not ineffective prior solutions.

What do engineers do? They create things; they improve understanding of a concept; they use science to solve problems, and they perfect a technique. Can engineering stand without science? To answer this question, Ananthasuresh quoted William Charles Kernot, "Theory and experience are of equal importance to the engineer. Theory without experience is the foundation without the superstructure. Experience without theory is the superstructure without the foundation. The former is useless, and the latter is dangerous". "As we talk about changing curriculum, we need to make sure the foundation is strong", said the speaker.

Two panel discussions were held on 'Enabling innovation and entrepreneurship in an academia-enabled environment' and 'AI in engineering'. Key points from these discussions are listed below.

Panel discussion 1: Enabling innovation and entrepreneurship in an academia-enabled environment

Moderator: Navakanta Bhat (Dean, Division of Interdisciplinary Sciences, IISc)

From left to right: Navakanta Bhat, Peichun Lin, Ashok Misra, T G Sitharam, and Hoe Joon Kim

- To create an ecosystem like that of Silicon Valley—founded by Frederick Terman, an Engineering Dean at Stanford University—what would we need?
- We would need inventions/innovations and put them to good use.
- Inventions should take place in academic institutions and research labs (to some extent). After this, engineering institutions should work closely with industry.
- In India, there is great potential and talent especially in the rural parts; the entrepreneurial startup culture has grown; majority of students know about IPR; this environment has to be nurtured.
- There is a reason why we have been learning thermodynamics for 150 years. Just because we are talking of educational innovation, it does not mean that what we have been doing is wrong. Nowadays, students want to do programming and artificial intelligence.
- A curriculum innovation is required to teach the next generation. The boundaries between departments have to be broken and an environment for innovation has to be created.
- In India, institutes find it difficult to pay for international patents. AICTE funds patent costs for students and faculty of AICTE-approved institutes. The cost of filing a patent has come down from Rs 28,000 to Rs 2,800.
- What is the effect of a thriving industry in the vicinity on the entrepreneurial ecosystem in an Institute? In the case of NTU, the presence of the semiconductor industry has influenced students to choose electronics engineering.

Semiconductors are very expensive for students to experiment with and the fabrication process in the company is more advanced than at the school. There is a special college on semiconductors at NTU, funded by the industry. However, if the semiconductor industry is lost, there is nothing. In the case of Korea, can Samsung and DGIST create a synergy to enable innovation and entrepreneurship at the Institute? In Korea, the ecosystem for a startup is not very friendly and it is very hard to survive. When 'smart' engineering students face such a challenge/fail, they are overwhelmed. There is a need to help them become resilient.

- The industry should visit incubation centres and startups and help in funding bigger companies acquiring startups.

Panel discussion 2: AI in engineering

Moderator: G K Ananthasuresh

From left to right: G K Ananthasuresh, So Kazama, Debalay Chakrabarti, Chi-Sheng Shih, Chun Kit Chui, and Dheepa Srinivasan

- "AI is in the air" and " data is driving us crazy"! How should AI be used in engineering?
- Before the advent of artificial intelligence, huge amounts of time had to be spent in developing software for fluid dynamics. Now, there is good use of AI in this area; however, students are unable to study coding.
- We need to welcome AI; however, training is very important.

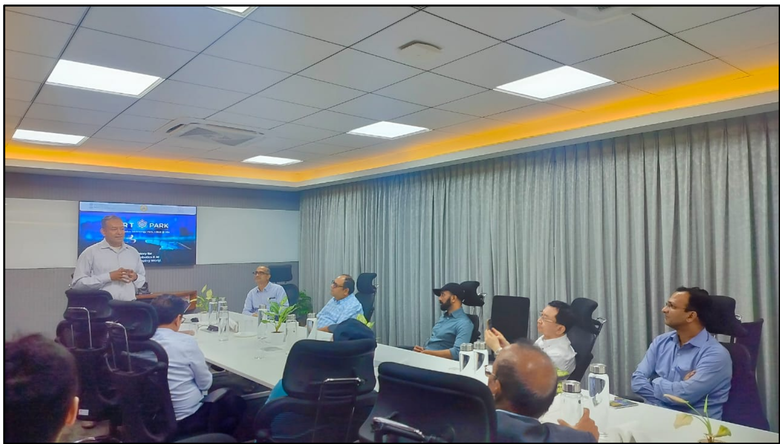
- Chi-Sheng Shih's descriptions of AI are (i) assisted intelligence (i.e. knowledge to help us work more efficiently) and (ii) augmented intelligence (i.e. we take its help when we do not have a particular capability). So, AI is definitely not going to replace people.
- At HKU, students usually preferred law and medicine, but now with AI, they prefer engineering.
- In practical engineering, all the industries have started using AI tools; however, the date needs to be robust.
- AI can be used effectively in research methodology and in collecting and labelling data.
- Through intelligent data analysis, AI can help students study real world scenarios.
- Students can be encouraged to search for solutions with access to large language models.
- In the next 20–30 years, the tools that we have now to teach engineering may change. We may not have time to look carefully at the available data. How do we develop tools to automatically clean the data?
- How will the introduction of technologies affect traditional roles and skill sets? We could think of 'upskilling' as 'reskilling' and the role of 'educator' as 'facilitator' in some of these cases.

IISc FACILITY VISITS

CENTRE FOR BRAIN RESEARCH

CENTRE FOR NANO SCIENCE AND ENGINEERING

ADVANCED FACILITY FOR MICROSCOPY AND MICROANALYSIS



ARTGARAGE

PROGRAMME – DAY 1

TALKS		
SESSION	**SPEAKER**	**TITLE OF TALK**
SESSION 1 Chair: G K Ananthasuresh	David J Srolovitz	Integrating AI into Undergraduate Engineering Education
	Mao Hsiung Chiang	Innovative Engineering Education in National Taiwan University
	Indranil Manna	Science–Engineering–Technology: the Synergy Needed for Sustainable Future
	Gautam Biswas	Undergraduate Curriculum Design
SESSION 2 Chair: K Manivannan	So Kazama	Cross Information Program – Fostering Engineering x Information Professionals
	Dheepa Srinivasan	Translational Research Leading to New Technology Introduction
	Kishore Kothapalli	Engineering and Learning-by-doing: How it is being Implemented at IIIT Hyderabad UG curriculum
	Chi-Sheng Shih	Research and Education for Autonomous Vehicles for CS Major Students at National Taiwan University
SESSION 3 Chair: Tarun Gupta	Sushma Kulkarni	Interdisciplinarity in Engineering Education
	Rupesh Vasani	Developing and Nurturing the Organic Curriculum
	Ajay Sethi	Engineering Minds, Entrepreneurial Spirits: Nurturing Entrepreneurial Mindset in Engineering Institutions
	Yuan Shen	Engineering Excellence: Strengthening Industrial and Global Perspectives in our EE Undergraduate Program
FACILITY VISIT		
Centre for Brain Research		
Centre for Nano Science and Engineering / ARTGarage		

PROGRAMME – DAY 2

TALKS		
SESSION	**SPEAKER**	**TITLE OF TALK**
SESSION 4 Chair: Sudarshan Kumar	Hoe Joon Kim	Convergence Engineering Education at DGIST: Student-centered Learning
	Nandini Kannan	Reimagining Engineering Education: Interdisciplinary, Project-based Learning
	Pardeep Kumar	Design Thinking & Innovations
	Ashok Misra	Research, Innovation and Entrepreneurship in Engneering Education
SESSION 5 Chair: Rajesh Sundaresan	T G Sitharam	Transformation of Technical Education in India
	Rohit Kandakatla	Increasing Regional and Local Relevance of Engineering Institutions through *Unnat Bharat Abhiyan*
	Divya Nalla	Curriculum Essentials for Future-ready Engineers
	Chun Kit Chui	The Journey of Establishing and Operating an Innovation Center to Nurture Future Engineering Innovators
SESSION 6 Chair: Debalay Chakrabarti	Tarun Gupta	Encouraging and Nurturing Innovation Temperament within IIT Kanpur
	G K Ananthasuresh	Engineering Temper
PANEL DISCUSSIONS		
TITLE	**MODERATOR**	**MEMBERS**
Enabling Innovation and Entrepreneurship in an Academia-enabled Environment	Navakanta Bhat	Peichun Lin, Ashok Misra, T G Sitharam, and Hoe Joon Kim
AI in Engineering	G K Ananthasuresh	So Kazama, Debalay Chakrabarti, Chi-Sheng Shih, Chun Kit Chui, and Dheepa Srinivasan
FACILITY VISIT		
Advanced Facility for Microscopy and Microanalysis		