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Design for the future

Designer-educator Sandy Speicher explains why design thinking is an effective tool to promote multi-sectoral learning across disciplines.

Soma Basu

Steve Jobs revolutionised our lives with smartphones by applying the principles of graphic design to personal computing. The Welsh School of Architecture is delving into how design can shape a supportive and nurturing end-of-life environment. Closer home, Bengaluru-based preventive healthcare service, NURA, works with hospitals to train and empower family caregivers to improve patient outcomes in healing at home.

This ability to synthesise and formulate creative solutions is a skill increasingly in demand and necessary to shape the future, says American designer-educator Sandy Speicher, who emphasises that design is the next big thing in education. Usually understood in terms of fashion, interiors, and aesthetics, design is also about creating human-centred, sustainable experiences that work in favour of people.

"Design education is not for self but public service; it is about how to make communities happy and prosperous," said Speicher, during an interview while on a visit to India to forge connections with institutions willing to integrate innovative design thinking with different academic streams. "It is the only way forward to navigate modern complexities."

Systemic and savvy

The former CEO of the global design firm IDEO, Speicher is currently an advisor at the BITS School of Design in Mumbai. She feels that, while India provides abundant opportunities for future careers and is a fantastic place to brainstorm ideas, "the country lacks a design identity. There is a need to harness the power of design thinking across all disciplines."

Design has to be systemic and savvy to community needs and offer real-time benefits to people. "In the social space, human-centred designing is happening, but it is not visible yet in the education sector. Learning about what support people need is how design ought to be taught and understood."

Take the case of pollution in Delhi. How can design thinking address the root causes, which come from population, human behaviour, geographical landscape and vagaries of weather? The issue is not – and should not be – the concern of environmentalists or scientists alone. Experts cutting across specialisations should feel the pain, imagine what can be done to alleviate the situation, execute a pro-active plan, and keep sharing the same.

"This is how design thinking operates: feel, imagine, do, and share. Every curriculum to sensitise students and turn them into mini-investigators in their respective fields of knowledge and steer them to problem-solving at every level, from local to global," says Speicher. According to her, the skills to bridge knowledge gaps independently, collaboratively, and resourcefully are most relevant today. A heart to build livelihoods and being sensitive to who is left out should be at the core of one's development.

Everybody thinks and acts like a designer; teachers are designers, but they neither know it nor have the language for it. When design keeps the human being at the centre of education instead of being more engineering or policy focussed, it is then sustainable.

Speicher says recognising design as a process creates deeper understanding and empathy. "It is vital to be attuned to people's needs, feel for the community, and support with simple solutions," she says, highlighting the success of a project in Latin America where she helped scale a network of schools in Peru and made education affordable for the country's growing middle class.

Successful projects

"We introduced a blended learning approach with indoor and outdoor classrooms and did away with rote learning. Students were given 'me time' to develop other skills or pursue research of their interest. The classrooms were turned into flexible spaces to accommodate more or fewer students. We also developed a database of 18,000 lesson plans for the teachers," she explains. Since 2011, Innova has grown to 80 schools with 80,000 students, expanded to Mexico, and has inspired similar education models worldwide.

In India, she worked with Kiran Bir Sethi on the Design for Change challenge for the preteens (10 to 13 years). The outlines are processed for children to create new ideas with innovative solutions. "To feel for another community and see another world beyond theirs imparts the power of 'I can' to the students."

Today, creative leaps are crucial without losing sight of the intersection of design, leadership and social impact. The pandemic taught us to focus on our relationships with everything – our work, organisations, other humans, and the planet – and is also shaping learning environments. "The best breakthroughs come with empathy and creativity. Good design projects bring the shared intent, vision and aligned commitments to improve the world and solve complex problems."

According to her, programmes that provide students with holistic transdisciplinary education practised through future-forward human-centred research will have an edge over others in the coming years. "Future design leaders have to be creative thinkers, problem identifiers and solvers, and aesthetically sensitive to responsibly simplify work in multidisciplinary groups."

SCHOLARSHIPS

Nikon Scholarship
An initiative from Nikon India
Eligibility: Indian citizen who has passed Class 12 and is pursuing a professional photography-related course (minimum three months) and has an annual family income not exceeding ₹600,000.
Rewards: Up to ₹100,000 based on the actual fee structure
Application: Online
Deadline: November 28
www.b4s.in/edge/NIKON13

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Instituted by the Aditya Birla Capital Foundation
Eligibility: Girls who are studying in school (Classes 9-12) or in graduation programmes (three- or four years) or PG courses at premier institutions and have scored minimum 60% in previous academic year and have an annual family income not exceeding ₹600,000.
Rewards: Up to ₹60,000
Application: Online
Deadline: December 7
www.b4s.in/edge/ABCC13

AICTE PG Scholarship
Offered by the All India Council for Technical Education, Ministry of Education, India
Eligibility: Students who have a valid GATE/ GPAT/ CEED score and are in the first year of a full-time M.Tech., M.E., M.Pharma, M.Arch., or M.Des. programmes at AICTE-recognised institutions.
Rewards: ₹12,400 per month for two years
Application: Online
Deadline: December 15
www.b4s.in/edge/AICT2

Courtesy: buddy4study.com

OFF THE EDGE
Nandini Raman

Master time management

Uncertain about your career options? Low on self-confidence? This column may help

I was admitted to Hansraj College in 2022 but had to opt for a distance course due to family reasons. I am preparing for government exams, but what opportunities do I have compared to my peers from regular colleges? Praveen

Dear Praveen,

While you may have missed out on the social aspects of campus life, you are gaining immense self-discipline, time management, and independence. Utilise these critical skills for your government exam preparation. Ensure that your degree is eligible and valid. Your score in the government exam is what matters. Focus on your goal and structure your day around exam prep without other distractions. Create a study schedule that suits your peak productivity hours. Use the time to build a powerful profile through online courses, certifications, and self-driven projects.

Excel in your course and aim for a high percentage, as it speaks volumes about your academic capability. Work on digital literacy and language, communication, public speaking, and interpersonal skills.

Look for online or part-time internship in content writing, research assistance, data entry, social media management, or with NGOs, as this shows initiative and gives you real-world experience. Build a professional LinkedIn profile. Connect with professionals, alumni from your school, and people in fields that you are interested in. Attend free online workshops, webinars, and seminars to keep you updated about your field and network.

I am a B.Sc. (Hons) Agriculture graduate. I have a strong interest in finance. How can I switch my domain? Vijay

Dear Vijay,

While it is possible to switch, you will need to acquire the foundational knowledge first. NSE's Certification in Financial Markets (NCFM) has modules like fundamental analysis, mutual funds, and currency derivatives, which are great short-term accredited certifications. The CFA, a rigorous and globally recognised qualification, is the gold standard for investment roles. The Post Graduate Certificate in Business Finance from NISM is another good option.

Take online courses such as Introduction to Corporate Finance, Financial Markets, Financial Modelling, and Investment Management from top universities. If you enjoy all this, consider an MBA in Finance or a Master's in Finance. Your unique profile can be a great differentiator in the admission process.

I am in Class 10. I want to study at IIT, but not Engineering. Are there other courses? Also, I want to join the Indian Army. What should I do for that? Reitha

Dear Reitha,

The main non-Engineering programmes in IITs are B.Sc. in Pure Sciences (a four-year programme in Physics, Chemistry, and Maths), the five-year Dual Degree Programmes (B.Sc. + M.Sc.), five-year Integrated M.A. in Development Studies or English Studies, and online degrees such as B.S in Data Science and Application. There are also many new Interdisciplinary programmes that are technically under the 'B.Tech' umbrella, but are less traditional and more science-oriented.

To join the Indian Army, you have to take the National Defence Academy (NDA) entrance exam after Class 12 for a three-year training programme, followed by specialised training at other national academies. You need to be 16.5 to 19.5 years old and should have passed or appeared in Class 12 with Physics, Chemistry, and Maths (PCM).

If you do not make it to NDA, you can take the Combined Defence Services Examination (CDS) after graduation. The eligibility is a Bachelor's degree, and the age limit is between 19 and 25 years). Graduates from any stream can apply, but, for the Army, a PCM background is beneficial.

I finished B.Sc. in Environmental Chemistry with Water Management. I want to do a PG in Environmental Science from a Central University. Are there good job opportunities after this? Sreelakshmi

Dear Sreelakshmi,

In India, there are opportunities across water and wastewater treatment, solid and hazardous waste management and environmental consulting. Almost every large corporation has an Environmental, Social, and Governance (ESG) team to manage its environmental footprint, ensure regulatory compliance, and prepare sustainability reports. The CSR departments often fund and manage many environmental projects.

In the public sector and government, jobs are available in pollution control boards for scientists, environmental engineers, and analysts. The Ministries of Environment, Forest and Climate Change, Jal Shakti, and Urban Development hire consultants and permanent staff for various projects. NGOs and international agencies also hire experts.

A Master's degree from a reputed foreign university is the most effective way to secure a job overseas. Job opportunities abroad are more structured and well-paying.

North America and Europe have stringent environmental laws that drive demand in consulting, government agencies, corporate sustainability, and the clean or greentech sector. Australia and West Asia offer roles in desalination, water recycling, and mining environmental management. Southeast Asia's rapid industrialisation needs environmental consultants to manage pollution and water resources.

Choose your PG specialisation wisely and look for programmes that are application-oriented and align with high-demand areas. Prioritise universities with strong placement records and industry connections. If you have a passion for research, a Ph.D. opens doors to advanced roles in academia, government labs, and the corporate sector.

Disclaimer: This column is merely a guiding voice and provides advice and suggestions on education and careers.

The writer is a practising counsellor and a trainer. Send your questions to eduplus.thehindu@gmail.com with the subject line Off the Edge.

Beyond ChatGPT tutorials

Comprehensive, hands-on, and context-aware AI education will ensure that today's students are not just keeping pace with AI's evolution, but actively shaping its future

Ravi Kaklasaria

Generative AI has leapt from research labs into everyday life at an unprecedented pace. For many, the gateway into this technology is ChatGPT, a conversational AI that can answer questions, draft essays, debug code, and even mimic creative styles. As a result, "How to use ChatGPT" has become a popular starting point to explore Artificial Intelligence.

However, many learners stop at basic prompting skills, mistaking familiarity with a single tool for mastery of the broader discipline. The reality is that generative AI is not just about typing instructions into a chatbot; it's about understanding the technology's foundations, limitations, and applications in varied real-world contexts. Thus, training must go beyond tutorials.

Learning to prompt ChatGPT is like learning to use a search engine. It's useful, but doesn't equip you to create one. Generative AI is powered by large language models (LLMs) and other architectures such as diffusion models for images or transformers for audio. Understanding the mechanics of tokenisation, embeddings, and attention mechanisms unlocks the ability to customise, fine-tune, or integrate these models into domain-specific solutions.

Structured learning paths

Today's industries are seeking professionals who can integrate AI into workflows using APIs, fine-tune models on proprietary data, implement guardrails for ethical and safe usage, and evaluate outputs for bias, accuracy, and compliance. These skills cannot be acquired through casual experimentation with a single chatbot. They require structured learning paths that combine theory, programming expertise, and practical projects.

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In higher education, generative AI training should be embedded within broader academic and professional contexts. A Media and Communication major, for instance, should learn how AI can assist in content ideation while also recognising risks such as misinformation and deepfakes. An Engineering student should explore AI-powered design optimisation while also mastering performance evaluation metrics for deployed models. Context-driven learning ensures that AI isn't treated as a novelty, but as a discipline with real implications for a learner's chosen career path. For an audience preparing to enter a competitive job market, this perspective is essential.

Another aspect is that merely reading about model capabilities does little to develop competence. Practical experience building chatbots, training domain-specific models and deploying them on cloud platforms is where true learning happens. Cloud-based labs and sandbox environments allow learners to interact with multiple AI frameworks like TensorFlow, PyTorch, and LangChain, experiment with different LLMs such as LLaMA, Claude, and Gemini, and test deployment strategies in simulated enterprise settings. By moving from "playing with AI" to "building with AI", learners develop confidence and problem-solving skills transferable to all roles.

One of the most overlooked aspects in self-guided ChatGPT usage is ethics. Large language models inherit biases from their training data, which can manifest in subtly prejudiced or outright inaccurate outputs. Without formal instruction, users may fail to detect or mitigate these risks. A comprehensive generative AI curriculum must cover dataset selection and curation, techniques for bias detection and mitigation, security concerns, including prompt injection and data leakage, and ethical literacy to ensure that AI professionals don't just build powerful tools but also trustworthy ones.

Generative AI's rapid evolution means that industry tools and academic syllabi are often out of sync. Many university courses still focus on traditional machine learning while overlooking applied generative AI techniques. Structured training programmes that partner with industry experts can help close this gap. For learners aged 18 and above, these industry-aligned modules will not only offer technical skills but also exposure to how enterprises are adopting AI in marketing, healthcare, finance, manufacturing, and creative industries.

Consumer to creator

Ultimately, higher education must drive the shift from AI consumers to AI creators. Knowing how to generate a blog post or summarise a document with ChatGPT is useful but building a domain-specific AI assistant, integrating it into a workflow, and ensuring its safe deployment will make a professional stand out.

Generative AI has already transformed how knowledge is created, shared, and consumed. For today's learners, especially those stepping into higher education or the workforce, it's not enough to be a skilled user of one tool. A deeper, more structured training approach spanning technology, application, and ethics is essential. By moving beyond basic tutorials and embracing comprehensive, hands-on, and context-aware AI education, the next generation can ensure they are not just keeping pace with AI's evolution, but actively shaping its future.

The writer is the co-founder and CEO of edForce

Major decisions

Tips to choose an MBA specialisation

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Akshita Arora
Pratik Modi

Choosing the right specialisation in MBA directly influences your career goals, interests, and market demand, ultimately shaping your professional trajectory. A well-chosen specialisation boosts your expertise in a specific field, increases your employability, and enhances your career success. With a wide range of options such as marketing, finance, operations, human resources, business analytics, and entrepreneurship, the decision can be daunting. Here are eight pointers to keep in mind.

Reflect on first-year experiences: Identify the subjects and courses you found most engaging and exciting in your first year. Analyse your performance, which may indicate both interest and aptitude in a particular course. Mihaly Csikszentmihalyi's flow theory suggests that, if you feel so engrossed in a subject that you lose track of time, you are passionate about it. This can drive long-term career satisfaction. Also, reflect on case studies or industrial visits that interested you.

Conduct a self-assessment: Are you talented in strategic thinking and creativity, or do you excel in data analysis and number crunching? Do you prefer working with numbers, leading teams, devising strategies, or interacting with people? Aligning your specialisation with your talents allows you to capitalise on your inherent capabilities. Next, evaluate your long-term career objectives. Where do you see yourself in the next five, 10, or 20 years? Are you enthusiastic about entrepreneurship, or do you see yourself in a leadership position at a multinational corporation or a startup? Defining your career objectives helps identify the specialisations that align with your vision.

Explore specialisations and course contents: Analyse the electives offered in your specialisation and decide whether the courses align with your interests. Examine the types of jobs and industries associated with each specialisation. Understand the various profiles and daily realities of roles.

Understand job market trends: Prioritise your long-term goals and opt for a specialisation that offers transferable skills, enabling you to adapt to evolving industry trends and opportunities. Consider the field's future growth and sustainability. Will the specialisation continue to be relevant and in demand in the years ahead? Also, shortlist your preferred industries. Knowing industry forecasts can help you make a forward-looking decision.

Seek guidance and advice: Seek guidance from professors, faculty mentors, alumni, industry professionals, and internship mentors. Connect with alumni who pursued different specialisations and find out about the challenges they encountered, their career paths, and their experiences. Participate in industry conferences, seminars, and networking events to gain insights into various fields.

Acquire practical experience: Summer internships or live projects can provide significant perspectives on daily operations. Participate in events in discipline-specific clubs to gain practical skills and networking opportunities. Additionally, consider the resources available at your university, such as research centres, industry partnerships, internships, and placements.

Consider personal factors: Some jobs may require longer hours and more travel, while others may offer more stability or less compensation. Your future work-life equilibrium may vary depending on your chosen specialisation. Certain specialisations are more prevalent in specific regions or cities, so this consideration may also guide your choice.

Prioritising passion over pay: Don't let the high salary offers from campus recruiters lead your decision. Instead, focus on your long-term interests and career goals. Avoid following the herd and choose courses that align with your passions rather than peer pressure.

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Focus on competence

Should the Teacher Eligibility Test (TET) be mandatory for in-service teachers?

WIDE ANGLE
Albert P' Rayan

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Two months ago, the Supreme Court ruled that all primary and upper-primary school teachers with more than five years of service remaining until superannuation and who had not yet taken the Teacher Eligibility Test (TET) must clear the test within two years in order to continue in service. This verdict has been opposed by several teacher associations in Tamil Nadu and West Bengal, as well as by the respective State governments, which have filed review petitions. They argue that it is unreasonable and unfair to require teachers appointed before the introduction of TET to clear the test at this stage of their careers.

I spoke to several teachers working in government, government-aided, and private schools regarding this verdict. Many feel that the ruling is unjust and poses a serious threat to their jobs. Indeed, making TET mandatory for those already in service is inequitable. It is the responsibility of teacher associations and State governments to safeguard the rights of in-service teachers who fear losing their jobs.

Why did the Supreme Court declare that clearing the TET is mandatory for all teachers, including those with more than two decades of experience? The likely reasoning is that the judges believed a uniform requirement would help improve the quality of school education in the country. No one would dispute that children's right to quality education must not be compromised. However, the assumption that all teachers who clear TET are effective educators and that those who cannot clear it are incapable of excellence is short-sighted and, arguably, unfounded.

Experience counts

Becoming a great teacher is a continuous process. It involves far more than passing a qualifying examination. A teacher eligibility test can assess a candidate's subject knowledge and understanding of pedagogical principles to some extent, but cannot measure their teaching skills, creativity, classroom management, or ability to connect with students. Passing a test does not guarantee teaching competence or practical classroom skills. A teacher's professional experience often matters more than academic qualifications alone.

Teaching is not static, nor should teachers be. Every day, educators encounter new situations, for example, through interactions with colleagues, students, and various resources that encourage them to experiment with fresh approaches and refine their practice. Such experiences foster a sense of dynamism that enriches both teaching and learning.

At the heart of this dynamism is a commitment to growth. Effective teachers continually update their knowledge, reflect on their work, adapt their methods, and, in the process, learn, unlearn, and relearn. Professional growth is an ongoing journey, and its benefits extend directly to student learning and holistic development.

While the TET serves as a useful criterion for entry into the profession, it is only one indicator of a teacher's potential. True effectiveness is shaped by many factors, including opportunities for in-service training programmes that strengthen the knowledge, skills, and attitudes of practising teachers and support their continued development.

Changing times

Some years ago, when talking to a schoolteacher about a professional development programme, I used terms such as Continuing Professional Development (CPD) and In-Service Education and Training (INSET). To my surprise, the teacher – who had nearly three decades of experience – said, "I have never attended any in-service training in my entire career. To be honest, terms and concepts like 'CPD' and 'INSET' are unfamiliar to me and to most of my colleagues." On further probing, she added, "The institutions where I worked never encouraged teachers to attend such programmes…"

Fortunately, this is no longer the case. Today, I often meet teachers in both government and private schools who participate in multiple training programmes to update their knowledge and enhance their skills. As a teacher trainer, I have visited several private schools across the country to conduct professional development programmes and have interacted with school managements, administrators, and teachers. An increasing number of institutions have begun to recognise the value of such capacity-building initiatives, and many teachers now feel that in-service training is, in several respects, even more important than pre-service training.

What measures should be taken to improve the quality of school education in the country? The National Education Policy (NEP) emphasises that ongoing professional development is vital for all teachers. The Central Board of Secondary Education (CBSE) also mandates in-service training and professional development for teachers and school administrators.

To ensure that teachers continually update their knowledge and develop new skills, school boards must cultivate a supportive and non-threatening environment that encourages active participation in in-service training programs. Taking this responsibility seriously will establish a strong foundation for quality education in the country. Enhancing teachers' competence is more important than merely preparing them for competitions. After all, competition breeds stress, while competence sparks creativity. Educational leaders must choose wisely.

Views expressed are personal

The writer is an ELT resource person and education columnist. Email rayanal@yahoo.co.uk

GREEN CAREER HUBS

Nature as classroom and career

Nature guide Payal Mehta on how her curiosity led to a life in the wild

The next in the monthly series by WWF-India that highlights niche and unconventional green careers through the stories of well-known personalities from the field of environment and conservation

Let me start by saying, I didn't "take a path." A path unfolded as I walked. Growing up, my parents' enthusiasm for Nature was infectious, yet my own relationship with it was different. I loved the night sky, rural landscapes, flowers, and fireflies. At the same time, formal education taught me about photosynthesis, the water cycle, tides, and genetics. However, all of this felt like separate puzzle pieces.

As a young adult, I had no fixed career ambition. I was curious about many things: pure sciences, mountaineering, journalism, and even dance. When I heard about a naturalist training programme at Kanha National Park, I decided to "check it out". The idea of working in the wild, leading tours, and sharing the wonders of Nature with others felt worth exploring.

I came with well-understood theoretical knowledge and a deep appreciation for the outdoors. But the first 30 days of training opened my eyes in unexpected ways. I learnt to distinguish species, observe behaviour, and ask deeper questions. Previously disconnected knowledge suddenly came together in a clear understanding of nature's intricate choreography.

After training, I worked as a professional naturalist in Kanha. Later, I left to pursue freelance tour leading across South Asia. During this time, restoration ecologist Pradip Krishen asked me to train two young men as naturalists for Rao Jodha Park in Jodhpur. That assignment opened many doors and training opportunities came through word of mouth. Harsha, an excellent naturalist, and I trained community youth with the Nature Conservation Foundation, created an online Nature Guide Course during the COVID lockdown and co-founded Nature Guides Academy with two fellow naturalists, Narayana and Shreenidhi, in 2024.

Currently, my days shift between two worlds. As a guide, I rise before sunrise, meet my group, and venture into the wild with our local team. We search for creatures big and small, share meals, and sometimes gather around bonfires to tell stories. As a mentor, my days are filled with teaching: field sessions on natural history, guiding skills, conservation, and tourism ethics.

The best part of my work is being in the wilderness, learning something new every day, meeting people from around the world, and witnessing that spark when a guest or young guide feels inspired to do more for nature. This requires more than just technical knowledge. It demands sensitivity toward wildlife, local communities, and guests. Some of my greatest teachers have been the communities we work with. While training the Idu Mishmi youth of Arunachal Pradesh, we were told it must be nature-culture guiding, not just nature guiding. Their lives are woven with the forest and its spirits. Practice walks ended with foraging dinner, bonfires with home-made *yuchi*, and forest stories. We learnt more than we taught.

To young people exploring this path, I say: choosing to be a naturalist is choosing a way of life. It is not just about knowing the wilderness, but also understanding people, respecting them, and standing up for what is right. A good guide becomes more than a naturalist. They become an example, a teacher, and a voice for the wild.

Future of flight

Why Aerospace Engineering students need knowledge of AI and Data Analytics

Priyank Kumar

The thrill of space exploration and lucrative opportunities make Aerospace Engineering a popular choice among students. However, the advent of AI and Data Analytics has transformed how aircraft and spacecraft are designed, built, and operated. AI plays a vital role in optimising designs, automating processes, and enabling predictive analytics, such as simulating various scenarios. Machine learning, in particular, analyses vast amounts of data generated from sensors embedded in models and aircraft to detect anomalies and suggest maintenance schedules.

Domain knowledge

To build a thriving career in the AI-powered aerospace industry, students must develop proficiency in domains such as programming and machine learning (ML), languages such as Python and MATrix LABoratory (MATLAB), and gain a solid understanding of ML algorithms and neural networks to design intelligent systems that can adapt and learn from data and focus on managing large datasets, streamlining data, and utilising tools such as Excel, Tableau, or Python libraries such as Pandas and Matplotlib to extract meaningful insights necessary to interpret complex aerospace data and make informed decisions.

As AI becomes more integrated into aerospace systems, it also introduces a host of ethical dilemmas and critical challenges that students must be prepared to address. A pressing concern is maintaining a balance between autonomy and human control. In machines like autonomous spacecraft, a malfunctioning AI could result in catastrophe. Therefore, students must understand the importance of human supervision and the development of fail-safe mechanisms.

Further, safeguarding data privacy and security presents numerous challenges. These systems handle highly confidential information, including defence-related data and passenger records. It is therefore imperative for students to have a deep understanding of encryption techniques, responsible data management, and adherence to global data protection standards.

Bias in AI models is another major concern. The effectiveness of AI systems depends heavily on the quality and neutrality of their training data. When datasets contain biases, the outputs can be misleading. Promoting fairness and accuracy in AI applications is therefore essential.

Due to the ongoing space exploration race among nations, the accumulation of space debris has emerged as a complex challenge that compromises the safety and sustainability of future missions. To address this issue, ethical responsibility must be instilled in students, emphasising the long-term sustainability of space operations and minimising environmental harm.

Varied perspectives

Encouraging students to adopt interdisciplinary perspectives, including legal, environmental, and philosophical viewpoints, is crucial. By analysing real-world case studies involving ethical dilemmas and system failures, students are empowered to make complex decisions they will encounter in their careers.

Moreover, non-technical skills such as critical thinking, problem-solving, effective communication, teamwork and project management skills are pivotal to long-term success. Since projects in this domain involve significant risks and intricate processes, evaluating alternatives and making strategic decisions under pressure is a key competency. Engineers must be able to convey ideas to professionals with non-technical backgrounds and collaborate effectively across multidisciplinary teams. Aerospace projects involve cross-functional units that require conflict management and initiative-taking. Finally comes the importance of meeting deadlines, resource allocation, and budgeting.

With a significant emphasis on interdisciplinary learning and nurturing a mindset of innovation and responsibility, budding aerospace engineers can fuel the transformation of the industry toward smarter, safer, and more sustainable technologies.

The writer is Head of Space Engineering and Rocketry Department, BIT Mesra.