



AN ENGINEERING EDUCATION SPECIAL

Trends in engineering education, what faculties are investing in, trending products and more

The new blueprint for engineering education

As artificial intelligence, sustainability mandates and national ambition redraw the profession, universities across the GCC are rethinking curricula, faculty and infrastructure to keep graduates ahead of a discipline that no longer stands still

By **Joseph George**

The forces reshaping engineering education are largely the same across institutions: artificial intelligence, sustainability, digital transformation and a national push towards a knowledge-based economy. What differs is how each university has chosen to respond, and how far the shift has moved beyond the traditional, discipline-bound model of training an engineer.

At Abu Dhabi University (ADU), Dr Hamdi Sheibani, dean of the College of Engineering, traces the change back to national innovation agendas and industry demand for future-ready talent. "Emerging fields such as artificial intelligence (AI), cybersecurity, robotics, advanced manufacturing and sustainable engineering have become increasingly embedded across engineering disciplines, requiring universities to continuously evolve their curricula and learning environments," he says. For Sheibani, the response has to be structural rather than cosmetic: "As technology continues to evolve, engineering education must remain agile, preparing graduates to lead innovation across critical sectors around the world."

Dr Fadi Aloul, dean of engineering at the American University of Sharjah (AUS) and chair of the UAE Engineering Deans Council, frames the same shift in terms of what today's engineer needs to know. "Today's engineers need strong technical foundations, but they must also understand AI, data analytics, sustainability, entrepreneurship and emerging technologies," says Aloul. Industry, he adds, is placing greater weight on adaptability and the ability to work across disciplines — a demand that has pushed AUS towards internships and industry-sponsored projects as core parts of the student journey, rather than optional extras.

Dr Harpreet Seth, interim head of the School of Energy, Geoscience, Infrastructure and Society at Heriot-Watt University Dubai, says technical expertise, on its own, is no longer treated as sufficient. "There



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Dean, College of Engineering,
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is also widespread recognition that engineering graduates require strong communication, leadership and problem-solving skills, alongside technical expertise, to thrive in today's global economy," says Seth. That view is consistent with a broader pattern across institutions: emerging technical fields are expanding what engineering covers, while soft skills are expanding what it takes to practise it.

The same drivers are visible elsewhere too. At BITS Pilani Dubai Campus, Prof Souri Banerjee, the campus director, points to a comparable alignment between curricula and the UAE's innovation-led economy. "Universities have increasingly aligned their curricula with emerging technologies and industry requirements, while strengthening research, entrepreneurship, experiential learning and partnerships with leading organisations," he says. The institution has launched a wave of new programmes over the past five years, including electronics and computer

engineering, robotics and industrial automation, and a sustainability-focused chemical engineering specialisation, backed by its long-running Practice School industry-immersion model.

At Manipal Academy of Higher Education (MAHE) Dubai, Dr Balamurugan Balusamy, dean of the School of Engineering & IT, attributes most of the recent change to a single driver: "Engineering education has changed a great deal over the past five years, driven largely by AI and digital technology," with laboratories modernised and industry partnerships deepened "with a clear focus on equipping graduates for where the profession is heading in the future."

Driven by national mandates

While keeping curricula up-to-date is a challenge, it is equally or more important to prove programme quality, and it is here that national policy becomes a more direct actor. Accreditation, research infrastructure and regulatory expectation are no more separate initiatives but aimed at creating the same outcome.

At ADU, Sheibani says accreditation is the foundation of quality. The College of Engineering now offers 24 internationally accredited undergraduate, master's and PhD programmes. He also links this directly to national direction: "These national ambitions are reflected in the continuous evolution of ADU's engineering programmes," he says, pointing to AI and data analytics becoming core competencies across disciplines rather than electives.

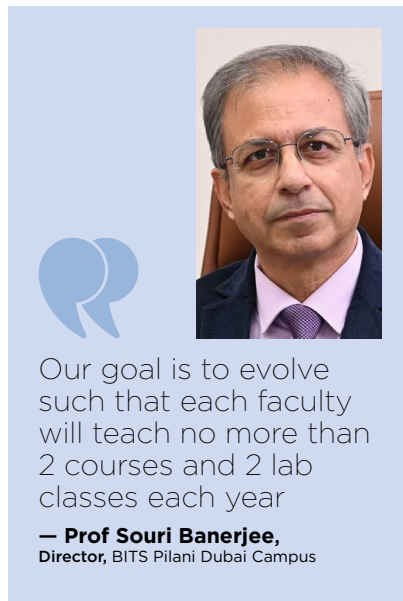
Making a similar case, Aloul says engineering education cannot be developed independently of the national priorities it is ultimately expected to serve. At AUS, that has meant building programme quality — captured in what he calls the "3 Rs" of recruit, retain and reward, while arguing that regulatory review has to be treated as a discipline rather than a formality. "The key is to remain agile. Technology and industry needs can evolve faster than traditional academic cycles, so universities must find ways to respond quickly while preserving

the depth and fundamentals that define a rigorous engineering education,” says Aloul.

At BITS Pilani Dubai, Banerjee says national policy, has encouraged the adoption of outcome-based education principles, shifting the emphasis from content delivery towards measurable learning outcomes and competency development, reinforced through curriculum co-design with industry, internships, capstone projects and periodic programme review.

Offering a more specific example of policy shaping day-to-day teaching, Seth credits Heriot-Watt Dubai’s industry advisory boards with keeping programmes “grounded in employer expectations.” Pointing to a direct line between national vision and classroom design, he says, “SDG targets have also been mapped to the objectives of the development plans of the local emirates and these inform the structure and content of the project-based learning and teaching within the programmes.”

At MAHE Dubai, Balusamy describes a similar continuous cycle of policy-driven updates — most recently around agentic AI and laboratory experiences — layered on top of a quality culture built through faculty development and treating research, in his words, as “part



of the learning process rather than something separate from it.”

Who’s enrolling, and why

Meanwhile, enrolment patterns are moving in a consistent direction across institutions towards programmes that combine engineering fundamentals with AI, data and sustainability, and towards students who no longer see

engineering as a single, isolated track. Alongside that shift sits a second, related trend — a push to widen who gets to study engineering in the first place, and a growing set of numbers institutions are willing to put behind it.

At ADU, Sheibani reports strong growth across disciplines generally, with particular interest in artificial intelligence, cybersecurity, robotics and renewable energy, reflected in new degrees including a BSc in artificial intelligence engineering, an MSc in cybersecurity, and PhD programmes in intelligent systems engineering and engineering management. That demand, he says, is not just about subject matter: “We are also seeing growing interest in interdisciplinary education, with students recognising the value of complementing engineering expertise with skills in AI, data analytics, entrepreneurship and leadership to succeed in an increasingly technology-driven economy.” On diversity, Sheibani points to growing female participation in architecture, computer engineering, AI and biomedical engineering, alongside a student body drawn from more than 100 nationalities, “creating a truly international learning environment where students benefit from diverse perspectives, cross-cultural collaboration and global exposure,” he says.



Universities in the region are responding to changing industry needs while preserving the fundamentals of engineering education

Aloul offers the sharpest figures on gender balance among the group. “Female students represent approximately 37% of our undergraduate population and 47% of our graduate population, significantly exceeding the international averages,” he says, numbers he credits to AUS’s recruit-retain-reward strategy, and which sit alongside a wider observation about how students now choose a university: not on the degree alone, but on the research, competitions and international exposure available around it. AUS graduates were ranked the top choice of UAE employers in the 2027 QS University World Rankings, a data point Aloul connects directly to that broader offer.

At MAHE Dubai, Balusamy identifies a related but distinct shift, away from theory and towards application. “They want to gain practical laboratory exposure and work with real technologies that connect directly to what employers are asking for, rather than abstract coursework,” he says, describing gender balance at MAHE as a product of admissions policy design. At BITS Pilani Dubai, Banerjee describes comparable movement towards interdisciplinary and emerging-technology programmes, alongside targeted outreach, merit-based scholarships and a campus society of women engineers that showcases the contributions of women already in the field. Seth, meanwhile, points to a specifically international dimension of the trend at Heriot-Watt Dubai, where an increasingly diverse student mix is enriched by the ability to study and collaborate across the university’s global campuses.

Curriculum innovation, industry tie-ups

Curriculum innovation, deeper industry partnerships and continued investment in laboratories and digital infrastructure emerge as the three pillars institutions are leaning on to prepare graduates for demands that have not fully materialised yet.

At ADU, that has meant introducing university-wide AI education, stackable micro-credentials and a new Applied Generative AI for Innovation and Future Readiness course, alongside partnerships with organisations, including ExxonMobil and Mott MacDonald, which give students direct exposure to industry projects. “Industry collaboration remains central to this approach,” says Sheibani.

At AUS, the CEN 2.0 curriculum overhaul and initiatives such as the AUS Engineering AI Nukhba Programme are framed by Aloul around a longer horizon than



AI, cybersecurity, robotics, advanced manufacturing and sustainable engineering are becoming integral to engineering education

employability alone: “Our objective is not simply to prepare students for their first job after graduation. It is to give them the knowledge, adaptability and mindset to succeed throughout careers that will continuously evolve alongside technology.”

Banerjee traces BITS Pilani Dubai’s industry collaboration back to the institute’s decades-old Practice School model, which places students in structured internships with national and global organisations, and points to how graduates have gone on to fund research infrastructure of their own with centres such as APPCAIR and the Ankitt Gaur Centre of Excellence, built as hubs for research in artificial intelligence, blockchain and Web3 technologies. “This virtuous cycle, where successful alumni reinvest in the institution’s academic and research ecosystem, continues to strengthen BITS Pilani’s ability to prepare engineers who are ready to lead, innovate and make a meaningful impact on society,” he says.

At MAHE Dubai, Balusamy locates the innovation earlier in the process, in how curriculum decisions get made at all. “Curriculum innovations go through a Board of Studies that brings in industry experts, alumni,



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Heriot-Watt University Dubai

employers, students and parents alongside academic staff so the input isn't purely internal," he says, arguing that this broader input is what keeps programmes grounded in what graduates will actually need. Heriot-Watt Dubai's contribution to the same trend is more experiential than structural. "Field trips, international competitions and learning outside the classroom are an integral part of the student learning and teaching," Seth says, describing project-based learning as central to how the school teaches rather than a supplement to it.

Faculty challenges

If curriculum and enrolment describe a sector expanding, faculty is where there is a real strain amidst competition not just between universities, but between universities and the industries their own graduates are entering.

Aloul describes the competition for engineering faculty as increasingly global, particularly in fields such as AI, cybersecurity and advanced manufacturing, where demand from industry is just as intense as demand from academia. AUS responds with what he calls the "3 Es" — empower, excel and entertain — and leans on the UAE's own ecosystem as a recruiting asset: "It provides a highly ambitious research and innovation ecosystem, strong connections between academia, government and industry, and access to rapidly developing sectors where



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Academy of Higher Education (MAHE) Dubai

research can have meaningful real-world impact," says Aloul.

Balusamy names the underlying tension more bluntly. "Industry moves faster than academia can always follow, and that gap is really the central challenge here," he says. MAHE Dubai's answer has been to bring industry practitioners directly into teaching, an arrangement he acknowledges is "not always

straightforward to integrate," but one that produces what he calls "a more balanced learning ecosystem."

Sheibani frames the same problem as one of continuous renewal rather than a one-time gap. ADU supports faculty through its Centre for Faculty Development and Learning Innovation and internal research grants, because, as he puts it, "universities must support academics in continuously updating their knowledge to reflect emerging technologies and changing industry practices."

Offering a most concrete commitment on workload, Banerjee says, "Our goal is to evolve such that each faculty will teach no more than 2 courses and 2 lab classes each year," he says, backed by seed grants for new research and active hiring aimed at reducing the load further.

Seth closes the picture with a recruiting argument specific to Heriot-Watt Dubai's position as part of a global institution: the difficulty lies in finding academics who combine "internationally recognised research with meaningful industry experience," but the country, he says, "provides us with the opportunity to tap into an international pool of academics with wide-ranging expertise."

Charting the GCC's next move

Looking beyond their own campuses, engineering education colleges point



Modernised laboratories and deeper industry partnerships are reshaping engineering education for the needs of tomorrow



Students are pairing engineering expertise with AI, data analytics, entrepreneurship and leadership skills to meet the demands of a technology-driven economy

to the same challenge — engineering education has to move at the same speed as the industries it serves — and the leaders share a common prescription: no single institution can make that happen alone.

Sheibani frames the challenge in terms of pace. AI, cybersecurity, robotics and smart energy are advancing faster than traditional academic cycles can track — and sees the opening for GCC universities in shared infrastructure rather than individual investment. “There is also a valuable opportunity for GCC universities to strengthen regional collaboration through shared research infrastructure, joint initiatives and greater academic mobility, enabling institutions to build complementary strengths while expanding opportunities for students across the region,” he says.

Aloul, sets the ambition higher still. The region’s scale of investment in AI, infrastructure and clean energy is, in his view, an opportunity for universities to do more than supply talent for existing jobs. “Ultimately, our collective goal should be bigger than preparing graduates for existing jobs. We need to develop engineers who can create the technologies,

companies and solutions that will define the UAE and the GCC’s future,” Aloul says, a view he ties to closer collaboration between universities, government and industry.

Banerjee identifies the same core tension raised earlier around faculty where rapid technological change is outpacing the connection between academia and industry, and names collaborative research funding, sponsored projects and mentorship programmes as the support that would help close it. Seth points to the region’s continued investment in advanced industries, infrastructure and clean energy as the biggest opportunity ahead. “Continued collaboration and dialogue between universities, policymakers and industry will be most valuable for ensuring that engineering education remains agile and addresses regional priorities,” he says. Balusamy closes on a similar note, tying the GCC’s potential to its fast-moving digital transformation: “The region’s adoption of AI and advanced technologies, supported by government initiatives, can enhance the positioning of GCC institutions among global leaders,” he says, adding that stronger IT infrastructure and closer academia-industry ties would help the region move faster still. ■



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