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Future of Core Engineering Jobs in India

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Core engineering: Time HEIs recognised future is not IT, CSE

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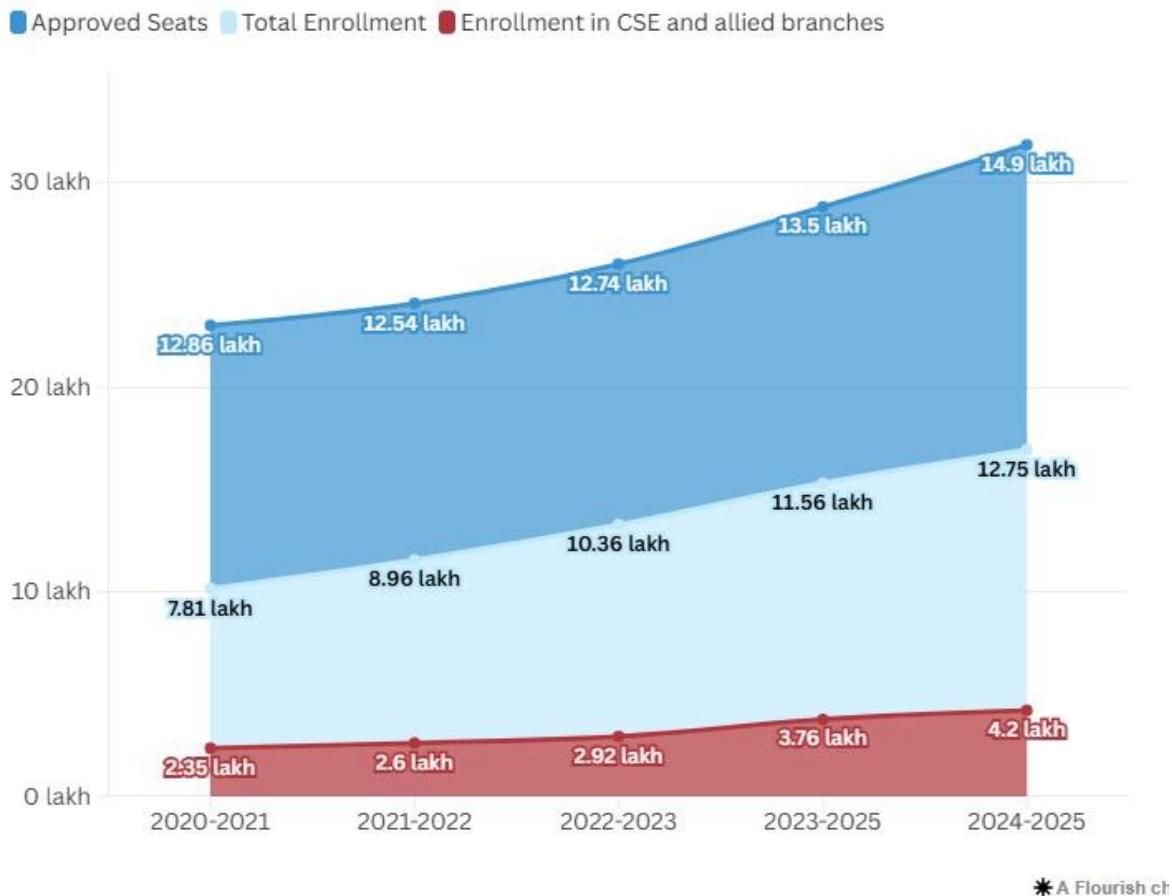
Recruitment of fresh BTech graduates by IT sector after peaking at 6 lakh in 2022, dropped to 2.50 lakh in 2023 and further slumped to less than 1 lakh in 2024. | iStock/Getty Images

As per recent All India Council for Technical Education (AICTE) data, B.Tech seats approved by it rose to a 14.90 lakh in the 2024-25 academic year reversing a seven-year downward trend. The sizeable growth of about 16% in the last four years is due to a steep increase of about 50% in Computer Science and allied branches like IT, Data Sciences, AI/ML, Cloud Computing, Block Chain, Cyber Security and so on.

While enrolments have grown by about 63% in the last five years, admissions in CSE and allied branches are estimated to have practically doubled from about 2.35 lakh in 2020-21 to about 4.50 Lakhs in 2024-25, whereas the same in Core Engineering disciplines like Civil, Mechanical, Chemical and Electrical have nosed down steeply. So much so, some

engineering colleges have even phased out these core branches. During 2024-25 alone, the AICTE approved the closure of 27 engineering Colleges and 1,025 courses.

BTech admissions: Seats Vs Enrollment



Recruitment of freshers by IT sector

Recruitment of fresh BTech graduates by IT sector after peaking at 6 lakh in 2022, dropped to 2.50 lakh in 2023 and further slumped to less than 1 lakh in 2024, due to slow down of the IT sector because of various geo-political-economic factors. Though a marginal improvement is expected in 2025, there are no visible signs of a turnaround happening any time soon. This coupled with the adverse impact of AI on IT jobs, particularly for the programming roles, raises the following questions :

Will such unabated increase in admissions in CSE and allied branches be in the interests of the students?

Will it create an imbalance in supply of engineers, excess in CSE discipline and shortfall in the core engineering disciplines, which may be needed the most, in the days to come?

It is in this context that an analysis of the future potential job opportunities for graduates in Core Engineering disciplines in the next 5-10 years should be made so as to enable the Institutions as well as the aspiring students to take informed decisions rather than being guided only by the immediate past or current demand by the students .

Global outlook

During Oct 2024, McKinsey Global Institute identified 18 high growth sectors, which are expected to reshape the global economy in the next 15 years and transform the Competitive Business Landscape. Each of them is expected to generate revenues ranging from \$1 trillion to \$20 trillion per year. They include four arenas of today, which were formed in the last two decades -- semiconductors, e-commerce, cloud services and electric vehicles (EVs) -- three spin-off areas (AI software and services, Digital Ads and Streaming Video) and balance 11 being emerging sectors -- rechargeable batteries, space technology, bio-technology, robotics, autonomous vehicles, lifestyle drugs, nuclear power, air mobility, cyber security, video games and modular construction.

As per the report, the sale of electric passenger vehicles may surpass that of Internal Combustion Engine vehicles (petrol and diesel driven) by 2030. According to Elon Musk, the CEO of Tesla, there will be at least 10 billion humanoid robots in the world by 2040, exceeding the global population at that time.

Though emerging IT technologies such as AI, Cloud and Cyber Security, will continue to drive all of the sectors, it will be primarily the products and the underlying technologies that will define the competitiveness and growth of the countries. Industry 5.0, which symbolises the Fifth Industrial Revolution, goes beyond efficiency, focusing on resilience and sustainability with human-centric technology. Also, most of the products are increasingly calling for a multi-disciplinary approach to design and service.

Renaissance of IT hardware

The rise of AI in the last two years due to easy-to-use Generative AI LLMs like ChatGPT has been creating high expectations of an AI-driven world. As AI applications continue to proliferate, the demand for IT hardware such as Graphic Processing Units (GPU), based on advanced semiconductor technologies, catering to AI workloads is skyrocketing. Besides, as electronics is increasingly embedded in all the products, be it consumer or industrial, IT hardware is getting back into the centre stage. Semiconductors, the foundational building blocks of hardware, enable advanced computing capabilities and power the IOT (Internet-of-Things) for interconnected devices. Emergence of semiconductor companies like NVidia in the top league is an indication of the shape of things to come.

How does it pan out in India

The last three decades have witnessed the steep growth of software that propelled an IT Services export-driven economy, which created lucrative jobs for the youngsters. However, during the last three years, as software services became increasingly commoditised, India is finding it difficult to sustain the competitive cost-arbitrage advantage of yester years.

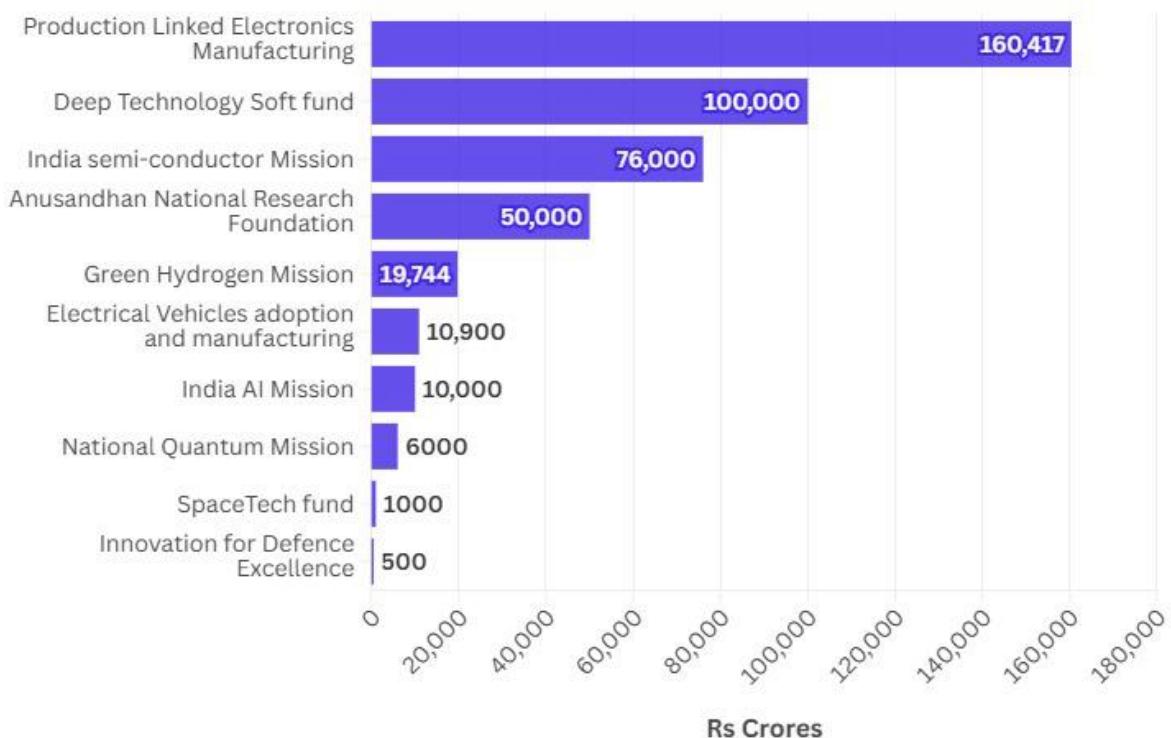
Meanwhile, as the world is fast taking a protectionist turn, developed countries are becoming possessive on sharing critical technologies. It is clear that India's aspiration of becoming a developed country cannot be achieved only on the basis of IT services exports. India has to become a product nation, build a deep technology ecosystem and create its own products and IPR, leveraging its world-class talent pool. It is all the more critical in strategic sectors like defence, security and space.

Government initiatives to promote strategic sectors

The government of India has identified electronics and semiconductors as strategic sectors. It has set a target of tripling the electronics sector output in the next five years, to \$ 500 billion by 2030 and unleashed a number of policy initiatives. Investments of over ₹ 1.30 lakh crore for semiconductor manufacturing by Tata Electronics, CG Power and Keynes Technology were approved under Semicon India Programme. AMD's collaboration with the Indian government will create supercomputers to improve weather forecasting and climate prediction. AMD is investing \$ 400 million in R&D in India, with the potential for even more investment.

Govt of India Schemes to promote manufacturing and R&D

Scheme



* A Flourish chart

In the words of our Prime Minister, “We are creating a workforce of 85,000 workers in semiconductor domain. India’s focus is to make its students ready as a workforce for the industry”. The government of India has launched mega promotional schemes, in mission mode, to promote indigenous manufacturing and technology innovation with funding of over ₹ 4 Lakh crore, which will create career opportunities in core engineering disciplines like Electronics, SpaceTech, Semiconductors and Mechanical Engineering.

GOI schemes to promote semiconductors

The approved semiconductor fabs are expected to be commissioned progressively in the next two to four years. As per a report from the talent solutions company, NLB Services, due to the investments by private players like Tata Electronics, CG Power, AMD, Vedanta and Micron Technologies, some 3 lakh jobs will be created in semiconductor fabrication in the next four to five years, and two lakh jobs in Chip ATMP (Assembly, Testing, Marking, and Packaging). Job profiles will be in various domains such as digital design, analog design, and mixed-signal design. Average starting salaries for VLSI (Very-Large-Scale Integration) design engineers are generally two to three times higher than those for entry level roles for software services.

Engineering design outsourcing centres

The engineering design outsourcing market in India has seen robust growth, with the market expected to reach a revenue of USD 798.1 million by 2030, growing at a compound annual growth rate (CAGR) of 25.7% from 2023 to 2030. EDOCs in India are involved in a wide range of activities, including: Product Conceptualization, Core Design Work, which includes Detailed engineering design, including mechanical, electrical, and software design, Prototyping and Testing and System Integration. The EDO sector has seen a surge

in recruitment, employing approximately 3 lakh professionals in 2023 compared to 2.2 lakh in 2018. Multinational Companies that have outsourced engineering services to Indian EDOCs include automotive companies (Rolls Royce, Jaguar, Daimler Benz) and aerospace firms (Airbus, Bombardier, Pratt and Whitney). Skills needed include Computer Aided Design and Engineering, Product Lifecycle Management (PLM) and Embedded Systems.

Global Capability Centres

In the last five years, India has emerged as a global hub for Global Capability Centres (GCCs), previously known as Captive Centres. These centres, set up by multinational corporations, focus on value-added services such as Research and Development (R&D), analytics, digital transformation, and innovation.

According to the NASSCOM-Zinnov report (2024), the Global Capability Centres (GCCs), the total number of GCCs has risen to over 1,700 in 2024 (from 1300 in 2019), with more than 2,975 centers across the country, currently employing over 19 lakh persons. About 85% of the GCCs are dedicated to Product Engineering and R&D services and they include Samsung, Intel, Cisco, Apple, Philips and General Electric (GE).

The number of GCCs are expected to reach 2,200 in the next five years, employing about 28 lakh persons, thereby increasing the demand for skills in R&D and product development. As per various reports, during the 2024-25 placement season, so far, 75% of the companies that visited the leading engineering colleges are GCCs that contributed 50% of the offers. As the placement season ends, we may well see this reach 70%. Also, salary levels offered were higher, starting at ₹ 6 lakh per year. It was also noticed that job profiles are better than the ones offered by IT services companies.

Private sector investments in manufacturing

The private sector is making substantial investments in manufacturing, which will revive the manufacturing sector and increase its share in GDP. The Tata Group is planning to create over 5 lakh new manufacturing jobs in the next five years, from their planned investments in manufacturing EV batteries, semiconductors, electric vehicles, solar equipment, and critical hardware. Most of the industry captains are bullish that core manufacturing will soon re-emerge as the major job provider.

What should engineering colleges do

It is time engineering colleges woke up to the ground realities and reviewed their plans for the future. It is understood that of late, a few colleges could not fulfil the requirement of core engineering graduates of the recruiters, due to lack of students in specific branches such as Civil, Mechanical and Electronics. In order to boost admissions in core engineering branches, the institutions need to build more awareness among aspiring students on the job potential in the core sectors such as Electronics, Semiconductors, Robotics, Electrical Vehicles, and Renewable Energy.

Further, they may allow them to pursue a minor degree or dual degree in emerging areas like AI/ML, Data Sciences, IOT, Cloud Computing etc, as it is acceptable by AICTE now. Besides, non-technical courses like Entrepreneurship, Patent Management and Business Planning may be offered as electives for aspiring entrepreneurs. This will enable students to integrate those skills into core engineering disciplines in roles such as product design, technical product management, product life cycle management, technocommercial management and so on.

In order to cater to the anticipated burgeoning demand for semiconductor professionals, institutions may offer semiconductors as a specialisation. They need to build a close connect with the semiconductor companies and understand the specific job roles and the competencies needed and equip the students accordingly. In the absence of semiconductor fabs in India, curriculum in most of the institutions has been limited to chip design and validation. Courses on Electronic Product Design, Fabrication Techniques and Packaging may be offered. The institutions need to upgrade their academic infrastructure (like labs and workshops) and upskill their faculty resources, taking help from industry professionals. There is a need to interface with end-user sectors like Space, Defence, Medical Devices and Telecom to understand user perspectives during the product design phase.

Conclusion

Indians are highly talented and have contributed immensely to the prosperity of developed countries, by creating cutting edge technologies and successful products worldwide. Now, it is up to India to leverage the same talent for enabling it to become Viksit Bharat. In this process, Higher Educational Institutions have to play the critical role of an alchemist, by grooming students accordingly.

(Dr O.R.S. Rao is the Chancellor, ICFAI University, Sikkim. Prior to shifting to academia, he worked in the IT industry for over 20 years. Views expressed are personal.)

