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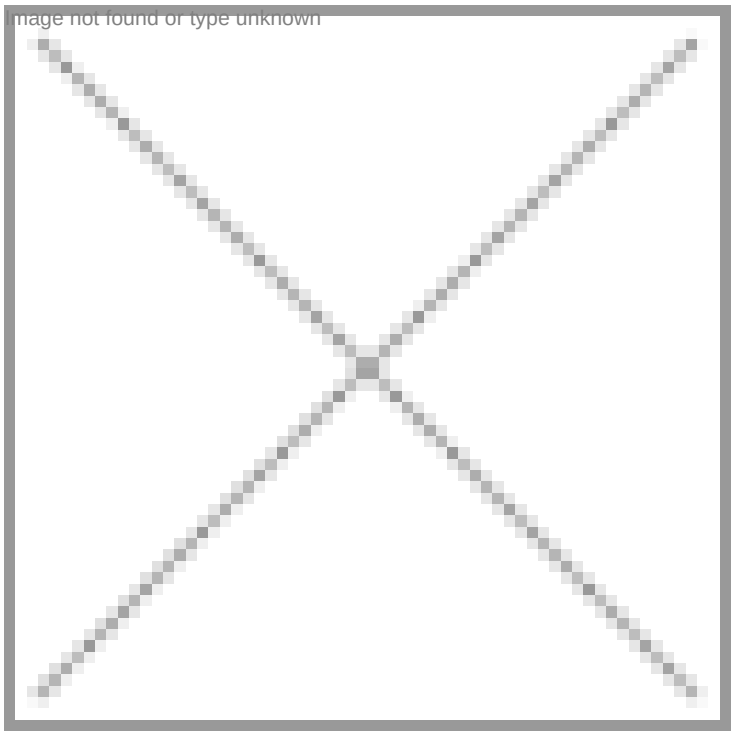

Bioengineering education perks up

A scientist often solves problems to understand nature. An engineer usually undertakes tasks that need to be done in a specified period of time on a fixed budget and with limited resources. Larger the information an engineer has at command and larger his technical and social skills, the more likely he will be able to do his job quickly and efficiently.

With the changing scenario, the role of technology is not limited to the production of man power for the organized industrial sector alone; it must also cater to the needs of the infrastructure and service sectors as well as the unorganized and rural sectors. The scope of enhancing productivity in these sectors by induction of improved technology is considerable. Some of the new emerging technologies such as information technology, communication technology, microelectronics, biotechnology and genetic engineering offer enormous scope for improving the efficiency of various types of production processes.

To enhance the production in areas like vaccines and recombinant products, we require a strong skilled workforce with both scientific and engineering background. Engineering is a design-oriented activity and engineering design is the most important ingredient in the education and training of an engineer. It is design that distinguishes an engineer from a scientist. The government has taken up many steps to train students in engineering field so as to meet the requirements of the industry and to build a strong and self-sufficient India.

"As against the regular courses, the engineering course in biotechnology helps the students to learn the basics of science and technology ie discovery to bulk production," observed Prof. R J Rayanade, Head of Department of Biotechnology

Engineering, Kolhapur Institute of Technology's College of Engineering, Kolhapur. He further said that by virtue of their education, the chemical engineers are more diverted in their activities towards chemicals and they find it difficult to look into biologicals. The engineers with a biotechnology background will do justice to the job as they know the basics of science and also have the knowledge on technology and its applications.

Biotech education in engineering colleges

Out of 1,222 engineering colleges that got the All India Council for Technical Education (AICTE)'s approval to offer courses in science and technology, 133 colleges (i.e., approximately 9.5 percent of the total colleges) are offering biotechnology as one of the courses (for the academic year 2004-05).

Taking into account at an average of 45 seats in each engineering college, as few colleges with a sanctioned intake of 30- 40-60, the total number of seats available to students in these 133 engineering colleges across India would be 5985. As per an estimate, the Visvesvaraiah Technological University, Belgaum in Karnataka alone is adding nearly 800 students in BE biotechnology a year. Besides we have many universities and leading technology institutions of India like Indian Institute of Technology offering BE/B Tech courses in Biotechnology.

The Department of Biotechnology (DBT) has been supporting post-graduate teaching in biotechnology in universities. Currently, the DBT is supporting biotechnology studies in 30 universities in the country. DBT is supporting studies in agriculture biotechnology in seven universities, biochemical engineering studies in six universities and neuro-science, marine biotechnology, industrial biotechnology, pharma biotechnology and IPR studies in 10 universities.

BT Engineering colleges	
Tamil Nadu	34 (251)
Andhra Pradesh	24 (228)
Karnataka	24 (112)
Uttar Pradesh	10 (83)
West Bengal	8 (52)
Kerala	6 (82)
Madhya Pradesh	5 (55)
Haryana	5 (36)
Rajasthan	4 (39)
Maharashtra	4 (95)

Note: (In the bracket the total number of engineering colleges in each state)

The biotechnology education in general and Bachelor of Engineering in biotechnology in particular has picked up in the last few years in states such as Tamil Nadu, Karnataka, Andhra Pradesh and Uttar Pradesh where we find the growth of biotechnology and more biotech companies have a base. Considering the government's initiative and positive attitude of the industry people, it is expected that more engineering colleges in states like West Bengal, Maharashtra, Punjab and Rajasthan would join the list of colleges offering biotech courses to meet the requirements of the industry.

Considering the opportunity and growth of biotechnology in India like the Information Technology boom in the late 1980s, managements of many private engineering colleges would apply to get the approval from AICTE to offer biotechnology as one of the courses to their existing list.

The biotechnology education requires high tech equipments to carry out the experiments at the lab level and also qualified and experienced teachers to train the younger generation. Barring a handful of colleges/universities, which got the recognition as the Center of Excellence and receive financial support from the University Grants Commission or from government agencies that these courses are run by institutions without adequate and appropriate facilities, in terms of class and lab space, lab equipment, library, adequately qualified teaching staff, etc., resulting in grossly underexposed and under-trained candidates. This certainly adds to fears.

The AICTE has recently showed a red signal to one of the private engineering colleges in Tamil Nadu (Saraswathi Velu College of Engineering, Sholinghur) in Vellore district by withdrawing its approval for the college to start biotechnology courses. This was done to check the growth of engineering institutions that lack basic facilities and have no good teaching staff. In a way such steps from AICTE would only improve the standard of engineering education in biotechnology in the country.

In some other engineering colleges it appears that the departments of chemical technology, wherever present, seem to stake claim to run the course in biotechnology, which is not in the interests of the course in the long run.

With the lack of trained and experienced staff, who have a hands on industrial experience, most of the college are depending on temporary staff (the so-called guest or visiting faculty). This visiting faculty does most or all of the teaching in biotechnology departments.

However, to overcome the lack of skilled and pool of talents, which is the need of the hour, Dr Vidita Vaidya of Tata Institute of Fundamental Research (TIFR) said, "Teaching should be encouraged at the research organizations. In this regard TIFR, a premier fundamental research organization in the country and a deemed university has already taken up an initiative." She also suggested for filling the gap that exists over the years between the industry and basic researchers/scientists.

Dr Kameswara Rao, executive secretary, Foundation for Biotechnology Awareness and Education (FBAE) based at Banaglore observed in a document on 'The State of Biotechnology Education' the need for an establishment of a high-

powered national statutory body, the Biotechnology Council of India, on the same lines as the AICTE, Medical Council, Dental Council, Pharmacy Council and the Bar Council that should have all the power to prescribe curricula and syllabi, standards of teaching facilities, qualifications of teachers and their emoluments, regulate fee structure and decide on all matters related to education and training in biotechnology in the country, and to affiliate or disaffiliate institutions. However, Dr Dhananjay Patankar, head, biotechnology, Intas Pharmaceuticals Ltd, Ahmedabad maintained, "We are happy with the students of University Institute of Chemical Technology (UICT), Mumbai where we conduct campus interviews." Intas Pharma used to recruit 3-4 freshers every year from this UICT that is strong on the biochemistry front.

Needs of the industry

The industry needs people appropriately trained in biotechnology and not mere degree holders. With changing scenario, most of the colleges/universities are preparing need- based syllabus with focus on application of science and technology, instead of focusing on providing a strong foundation in basics which will prove to support the students in understanding various topics in biotechnology even at later stage. "Yes to some extent the industry need-based approach may create a problem for the students in the long run, "said Prof. Rayanade of Kolhapur Institute of Technology's College of Engineering.

The efforts in capacity building in biotechnology will not serve by enormous enrolment, which will only kill the prospects of meaningful education in the area and ruin careers. It is unethical to allow hype to build up in education to foster moneymaking organizations, in the name of service to education. Once the hype recedes, the whole system collapses, severely damaging the county's interests.

"As the industry is small and very capital intensive, the demand is not much. To be very honest, the flow of talent in biotechnology space is more against the industry demand. Companies like Ranbaxy, a leading pharmaceutical company in India is recruiting handful of candidates/freshers. The companies look at experienced candidates. In few years we will find a lot of biotechnology graduates without jobs. Hence the authorities in AICTE should look at the issue and have to put a check on giving permission to more number of colleges.

To overcome the hype, Kolhapur Institute of Technology's College of Engineering, one of the four engineering colleges offering biotechnology in Maharashtra is having three types of students. First type are those who look for higher education, second â€“ those who opt for jobs immediately after coming out from the colleges due to the poor financial status of the families and finally the third type who are looking at becoming entrepreneurs.

Besides providing the basics of biotechnology, the institutions should look at developing the technical skills of the students. This can be done by entering into tie-ups with companies and leading research organizations of the country like Indian Institute of Technology, Kharagpur.

Department of Biotechnology
The Department of Biotechnology and Biochemical Engineering at Indian Institute of Technology, Kharagpur, which was started in 1986 with the joint sponsorship of the Ministry of Human Resources Development and offering B Tech (honorary) courses in biotechnology and biochemical engineering (4 years) and B Tech (honorary) and M Tech in biotechnology and biochemical engineering (five years) integrated courses has already engaged in collaborative projects with leading companies like Hindustan Lever, Bangalore, Tata Tea, Kolkata, AMS Baeshen, Saudi Arabia, Bharat Serums & Vaccines, Mumbai, Tarson Products, Kolkata and has been involved in different research areas like Biochemical Engineering, Environmental Biotechnology, Enzyme and Lectin Biotechnology, Genetics, Immunology and Molecular Biology, Microbial Biotechnology, Microbial and Plant Biotechnology, Virology and Molecular Biology, Structural Biology, Biochemical and Bioprocess Engineering.

Quality education

The economic progress of a country is strongly linked to the quality of education. It is therefore, necessary to undertake periodic review of the curriculum and subject content of the technical programs to ensure that they are up to date not outmoded or obsolete and effectively fulfil the technological requirements of the country. Steps like setting up an expert panel by DBT under the leadership of Prof. A.S.Kolaskar, vice chancellor, University of Pune to look into the human resources development required for the biotechnology industry have been taken to improve the quality of technical education.

The other steps to be taken include evolution of model syllabi, quality improvement programs for teachers, encouraging interaction with industry through consultancy and continuing education programs; and providing impetus for expanding infra-structural facilities in emerging technologies.

To make the Indian biotech industry internationally competitive, the frontier technologies have to flow from the R&D institutions to the industries and also be continually infused in the engineering curriculum. Thus, it is pertinent that educational

sponsored programs*
Indian Institute of Technology, Kharagpur
Indian Institute of Technology, New Delhi
Anna University, Chennai
University Institute of Chemical Technology, Mumbai formerly UDCT
West Bengal University of Technology, Kolkata
Indian Institute of Technology, Kanpur
National Institute of Pharmaceutical Education & Research Mohali (M Tech Pharmaceutical Biotechnology - 2-year course)

*Programs include B Tech /M Tech in biochemcial engineering and biotechnology (five-year integrated or four-semesters or two-year courses)

institutions, industries, and research institutions which are at the three vertices of a triangle should converge at some nucleus through coordinated research in both conventional and emerging fields catering to the need of the industry, which will be transferred to the industry and also amalgamated in the engineering curricula.

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