

Engineering Education in West Bengal - Its Challenges and Prospects

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Abstract

Engineering education system in West Bengal is a time-tested paradigm catering for decades to the industries and academia. Yet there are many loopholes in the system due to induction of private enterprises for running colleges as has been pointed out by Professor C N R Rao and many other committees. This paper tries to unfold the un-cared lacunae of present engineering education and suggest remedial measures.

Keywords:

History

Because every future planning should be made on the basis of the experience earned in the past, it is essential that the history of higher education is looked into.

Bengal, in particular, Kolkata had played a pioneering role in the development of modern education system in India. The Western model of education came to India through Kolkata only. Many of the first schools and colleges were set up by the missionaries and reformers. Sir William Jones established the Asiatic Society in 1784 for promoting oriental studies. The Fort William College was established in 1800; the Hindu College, renamed later as Presidency College was set up in 1817. The Serampur College was established by William Carey in 1819, which went on to become India's first modern university in 1827 incorporated by a Royal Charter as a Danish University. The Sanskrit College was established in 1824. Reverend Alexander Duff of the Church of Scotland established the General Assemblies' Institute in 1830 and later the Free Church Institution in 1844, which were merged later into a single college, viz. Scottish Church College. These institutions played a significant role in the famous Bengal Renaissance. La Martiniere Calcutta was set up in 1836. John Bethune in 1850 established a school for the education of Indian Girls. The Berthune college for girls was set up by Mr. Bethune in 1879. The oldest medical school in Asia was set up in 1835, and was later named Calcutta Medical college. In 1857, the university of Calcutta modeled after the University of

London was established as the first multidisciplinary university in South Asia. Today this is the largest such universities of India offering the widest number of academic programmes. The Jesuit fathers established St. Xavier’s College in Calcutta in 1860.

As regards engineering education, the British rulers were also concerned and therefore they set up four engineering colleges in four corners of India – Rourkee (1847), Shibpore (1856), Guindy (1794) and Poona (1854) to train the engineers employed or to be employed for civil construction mainly and other engineering activities. These four engineering colleges had a total enrolment of 608 students during 1984 – 85. Following the partition of Bengal in 1906 the National Council of Education was set up in Bengal and this was converted into Jadavpur University in 1955. The Science College of Calcutta University was set up in 1917 Two other prominent institutions, Indian Institute of Science and BHU were set up in 1908 and 1916 respectively, the first by the Tatas and the second by Pandit Madan Mohan Malavya.

At the time of independence there were only 24 engineering degree colleges with a total intake capacity of 2570.

The N.R. Sarkar Committee, constituted in 1945 recommended the setting up of four higher technical institutions patterned after the Massachusetts Institute of Technology, USA in four regions of the country. In compliance, the Govt. of India established five IIT’s at Kharagpur (1951), Bombay(1958), Madras(1959), Kanpur(1960) and Delhi (1961) as institutions of national importance.

After a gap of over three decades realizing the necessity of more engineers, the Govt. of India upgraded in 2001 Roorki Engineering College to an IIT and established further IIT’s at Guwahati (1995), Patna (2001), Jodhpur (2008), Hyderabad(2009) and Gandhinagar(2009), Ropar(2009), Bhubaneswar (2008), Mandi (2008) and Indore(2008) making the total fifteen, the older IITs are mentoring the new ones. The intake of students at different levels into the IITs in 2010 – 11 and faculty strength are as follows:

UG	14, 359
PG	14, 234
Ph. D	3,459
Faculty	6,081

The recent eight IIT s have limited UG , PG and Ph.D. enrolments. In a couple of years they are expected to accommodate 15,000 UGs, 10,000 PGs and 8,000 Ph.D Aspirants. In respect of the total enrolment of all engineering students of in India, the enrolment at 5 IITs is almost insignificant.

The 20 RECs late renamed as NITs that came up as the next tier engineering institution funded by Govt. of India admitted 9297 in the under graduate curricula and 4569 in the post-graduate

curricula in 2007 – 08. The Govt. has proposed to set up 10 more NITs within the next five years.

Apart from the above, there are State Govt. run engineering colleges, with affiliation to some universities which accommodate nearly students. Indeed the great demand for engineering education has led to the mushrooming of engineering colleges by private trusts and societies and has subjected significant decrease of quality. The fall of quality is generally attributed to lack of qualified teachers and insufficient infrastructure. It is shocking that NASSCOM has remarked through a survey that only 17 % of the IT-graduates produced in India are employable.

Another class of engineering institutes has been constituted by the Indian Institutes of Information Technology (IITs) and Indian Institute of Science Education and Research (IISERs) with a intake capacity of students.

The following table shows the number of universities and engineering institutes in West Bengal as compared to India.

Table 1. Showing the no. of academic bodies in West Bengal and India in 2012

Category	India	West Bengal
Central University	42	2
State Universities	285	20
Deemed University	130	Nil
Private University	112	2
Engineering College	2388 (in 2008)	155
Polytechnic	1244(in 2005-06)	50

There are already a good number of colleges in the state where 40 to 50 percent of seats remain vacant over the years due to lack of social accreditation.

The Government College of Art & Craft was established in 1951. The Rabindra Bharati University was founded in 1962. The Indian Institute of Social Welfare and Business Management, India's first management institute was set up in in 1953. The oldest and the most prestigious management institute Indian Institute of Management was set up in 1961 in Calcutta in collaboration with the Ford Foundation and The MIT Sloan School of Management.

The next lower level engineering education is catered by polytechnics. There are as many as 50 polytechnics of which 35 are run by the State Government and 15 by private enterprises. These polytechnics offer almost all the types of technical (Diploma) courses as offered by the (Degree) colleges and universities. For specialized courses however there are separate technical institutes such as Institute of Jute Technology, Leather Technology, textile technology etc.

The Challenges

Though apparently the system is working nicely producing lakhs of engineering graduates and diploma holders the NASSCOM has recently pointed out that even 80% of the IT-graduates are not employable. Many other chambers have expressed in different forms deep concern about the quality of graduates produced in the last two decades in particular.

If we look into these observations meticulously, we will see that there is some substance in it. Except those produced by IIT's, NITs, and a few universities there is a noticeable lack of quality in the rest. Low quality of students admitted to help some private colleges survive partially account for the low products also.

The findings have pointed out the following lacunae:

1. Miserable domain knowledge
2. Want of innovative ideas (indicated by too few patents)
3. Poor communication skill
4. Insufficient hand-on practice
5. Lack of leadership quality
6. Weak mathematical base to face challenges

So for upgradation it is a dire necessity that measures are taken to free them from the said shortcomings..

Apart from the above drawbacks of the system, another factor that is substantially responsible for unemployability is the indifference of many universities to updation of syllabus as per requirements of the industry and also to the latest technologies.

The Remedial Measures

The removal of the above-mentioned lacunae is not an easy job, yet it is not unachievable. Sincere efforts and proper planning can only do this.

For example, *to enhance the domain knowledge* one has to remember the constraints first.

These are

- (1) Except a very few residential colleges, all colleges have a time limit for daily classes where as residential colleges can start at 7 am and continue till 8/9 pm, other colleges can afford to start their classes at 9 am earliest and 6 pm latest.
- (2) Proper faculties are rarely available in colleges situated at far off places.

- (3) Though libraries are more or less equipped, laboratories and workshops are not.
- (4) Question papers are to be set keeping in view the large number of students that appear at the examinations and also the fact that a reasonable number of examinees have to pass.
- (5) Quality of teaching is often frustrating.
- (6) The system is often information intensive rather than learning intensive and therefore leading to rote learning.

So the following steps are suggested: In this matter the recommendations of Mashelkar [6] may be recalled.

- (a) There should be no compromise with regard to the quality of a teacher for appointment. Before permanent appointment he/she should be tested for at least six months.
- (b) The new faculties are to be subjected to compulsory training as to pedagogy, i.e. methods of teaching. For example, if a teacher revises what was taught in the last two/three days in his classes, the student will not lose interest in the class. Similarly a revision of the entire matter taught in a class will help the erring students and also one who joins the class a few minutes late. Preferably such training should be organized several times in a year. If this is not feasible, at the beginning of each semester this should be done.
- (c) At the beginning of each semester an assignment must be given to each student with the mention of a specific date for submission and failure to do so should imply ineligibility to appear at the semester end examination. In viva, questions should be asked from the assignment to see that they were solved by the students themselves.
- (d) Before delivering a lecture a hand-out containing the outline of the lecture, names of the related U tube lectures and books that deals with that matters should be distributed..
- (e) The students should submit a list of the U-tube lectures that he/she saw in every week for being eligible to appear at the examination. In viva, question should be asked from those lectures.
- (f) Stereotype questions should be avoided as far as practicable in any examination.
- (g) A notice should be hung mentioning the hours teachers will be available for doubt clearing and consultation.
- (h) Frequent on-line examinations should be held to see how much a student has grasped or understood.
- (i) Excellent teachers from universities and other colleges should be invited to deliver lectures on basic knowledge and for inspiration.

- (j) Unnecessary materials of the syllabus, if any, should be stripped of.
- (k) It is hoped with the strict implementation of the above suggestions the domain knowledge will increase substantially. For this no additional resource will be required except projectors. In this regard, the affiliating universities and the Govt. can play a determining role by sending inspection teams more frequently and without prior information
- (l) Practical classes should be complementary to the theory classes in the sense that every practical class should begin with a revision of the relevant theory.
- (m) Tutorial classes should be arranged with smaller size and various technical problems should be discussed. If necessary, the theory classes can be replicated before pouncing on technical problems.

For innovative ideas, the students should be provided with the facilities to work with experienced professors, particularly with those who contributed many patents. In this regard, Chinese professors may be invited to India to work with young engineers as China is second to USA in respect of getting patents.

As regards communication skill, special software developed for augmenting the soft skill is paying back not upto expectation for lack of sincere efforts. The colleges should give enough emphasis on the holding of techno-complete English Language classes.

The class routine should be so prepared that the students get more time to work with the machines. By this they will enjoy learning but gain confidence in engineering work.

Though leadership quality is inborn, one has to have enough opportunity for harnessing the quality. For this small groups are to be formed and given practical work. The leaders should be changed at regular intervals so as to give scope to all and sundry.

Though the importance of Mathematics is known to everybody, necessary emphasis is missing by almost all academic administrators of engineering colleges. Good inspiring teachers are the precondition for developing an aptitude in Mathematics. With the demonstration of the so-called magical powers of mathematics in solving engineering problems, interest will grow and thereby the confidence will rise to the peak.

It suffices to mention that the observations made about the degree colleges apply also to the polytechnics.

Prospects

However gloom apparently it may seem, the actual situation of science and technology is not that bad. According to Sam Pitroda, Scientific Advisor to the Prime minister, "We have the workforce of the world, not just for India. Unlike China India's growth will be driven by

domestic consumption. It has been estimated by the UNO that the requirement of engineers in the world by the end of 2015 will exceed one lakh. But this requires strict implementation of certain policies, namely with regard to recruitment of faculties, holding theoretical and practical classes regularly, associate with research and development work and doing project work honestly.

With this in view the sooner we start revamping our education system, the better will be our future. There is no doubt that the system is as of now is limping because of many factors, some of which are not redressible instantly. In some government colleges also without relevant faculty strength, some streams have been opened which is causing a lot of suffering for the students. In some cases, there are a large number of vacant positions which need to be filled up to do proper justice to the students.

It would not be out of place to mention here that though many have argued in favour of induction of private enterprises for the advancement of science and engineering education in India to cope with the global demand, it cannot be denied that these entrepreneurs are guided by profit-motive in general. Save a few such private colleges, almost all try tactfully to evade govt. rules and university requirements to attain financial benefits which ultimately tell upon the academic health of the college, grossly affecting the quality of the products. Thus so long there will be private colleges, it will be difficult to maintain the desired standard and will have to depend on IIT's, NITs, IIITs and the university colleges for excellence. It is needless to mention that strict vigilance by universities and governments on the private colleges can only reduce these obnoxious activities but cannot eliminate them completely.

In certain cases the authority should be strict enough to close down certain colleges if the quality requirements for technical posts are not met with. References may be taken from MCI (the Medical Council of India) decisions with regard to the strictness shown for Medical Colleges across the country.

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