Chapter – 2

HISTORICAL DEVELOPMENT OF TECHNICAL EDUCATION IN INDIA

The history of technical education in India can be traced to Epic Period (1000BC) and Vedic period (Prior to 500 BC) when numerous technical skills such as carpentry, smithy, foundry, and weaving were part of education. Later during medieval India, the vocational skill reached great heights as it is evident from the findings of the archaeological remains of the period.

Archaeologists discovered two cities which were four thousand years old, four hundred miles apart along the banks of the Indus River in Pakistan. These expertly constructed cities were parts of an advanced civilization comparable to ancient Mesopotamia and Egypt. Archaeologists named the cities Mohenjo-Daro, Which means “hill of the dead,” and Harappa, after a nearby city.

Archaeologists have found the remains of fine jewelry, including stones from far way places. This shows that the people of the Indus valley civilization valued art and traded with other cultures. It seemed that Indus River Valley civilization had been abandoned about 1700 BC with the great floods and earthquake. Archaeologists continued to find new artifacts. The high quality of the articles such as cotton and silk fabrics, embroidery painted and enameled wares, gold and silver jewellery, swords and knives potters, metal utensils could not have been achieved and sustained for such a long period without a dependable system of technical education.

However, the modern cult of technical education began in India with the establishment of “Survey School” at Madras (Now Chennai) by the English traders in 1794. Besides assisting the British surveyors, the School provided training to Indian personal in modern land survey. Later on, technical education spread to other parts of the country and was transferred from generation to generation.

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The Industrial Revolution was a period from the 18th to the 19th century where major changes in agriculture, manufacturing, mining, transport, and technology had a profound effect on the socioeconomic and cultural conditions starting in the United Kingdom, then subsequently spreading throughout Europe, North America, and eventually the world. The Industrial Revolution marks a major turning point in human history. Almost every aspect of daily life was eventually influenced in some way.

The Industrial Revolution introduced new elements in the concept of production, distribution, and laid the foundation of technosavory civilization. It was based on the fast developments in science and its applications. It started with the mechanization of textile industries, the development of iron-making techniques and the increased use of refined coal. Trade expansion was enabled by the introduction of canals, roads and railways. Mechanization started with the steam engine by Thomas Savery, lightbulb and phonograph by Thomas Alva Edison were invented. Mechanization of small jobs and invention of myriads of machine was made possible. It gave birth to the technology of the mass production, quality products at affordable prices. Many manufacturing units came up which required unskilled as well as skilled labour. To train technicians, many technical schools were instituted as in 1842 an industrial school was established at Guindy, Madras which was attached to Gun Carriage Factory. The Industrial Revolution of the 19th century in Europe can be said to be the real beginning of the engineering era.

In the same century, many inventions in various forms took place and opened up a new horizon in the industrial world. Machines were invented to help human beings to increase their productivity with less labour. It was soon realized that the old system of training of artisans by passing on knowledge and skills from generation to generation of craftsmen and artisans were not useful. Technological changes were constantly influencing the system of production and distribution, and it was necessary to develop a new learning system specially designed to meet the challenges of occupational needs in the industry and maintenance of its products. Thus, a new system of learning process was born by combining academic education with skill training, specially tailor made learning-training system specially designed for supply of trained manpower for industrial and economic development through judicious

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application of science and technology, is closely related to the state policy for industrial development and economic growth. In the field of education, technical education is relatively a new comer in comparison to other disciplines\(^1\).

Although, scientific development geared up to a great extent at that time, there was lack of coordination between scientific community and technicians. At that time, scientific people mostly governed technological innovations, while technicians were people like masons and artisans who did not know how the scientific principles are applied to the technological innovations. This feeling of need for an organized way of imparting technical knowledge to the technicians at that time translated it to the education in engineering.

At the beginning, technical education started in a form of training and apprenticeship in the trades of craftsman and artisans. The first technological institute came into existence about eighty years after the industrial revolution as a school for teaching apprentices. In 1790, John Anderson and in 1794 Dr. Biskbeck established two schools in Glasgow and in France respectively of apprenticeship for artisans and craftsmen. The Anderson’s school became the “Royal Technical College, Glasgow”.

<table>
<thead>
<tr>
<th>Year</th>
<th>Place</th>
<th>School/College</th>
<th>Branch</th>
<th>New Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1790</td>
<td>Glasgow</td>
<td>School of apprenticeship</td>
<td>Craftsman &amp; artisans</td>
<td>Royal Technical College</td>
</tr>
<tr>
<td>1823</td>
<td>Maine, USA</td>
<td>Bowdolin College</td>
<td></td>
<td>Discontinued</td>
</tr>
<tr>
<td>1823</td>
<td>New York</td>
<td>Rensseluer Polytecnque</td>
<td>Civil Engineering</td>
<td>Rensselaer Polytechnic Institute</td>
</tr>
<tr>
<td>1879</td>
<td>Charlotteberg, Berlin</td>
<td>Technische Hocuile</td>
<td></td>
<td>Discontinued</td>
</tr>
<tr>
<td>1890</td>
<td>Massachusetts Institute of Technology USA</td>
<td>MIT</td>
<td>Electrical Engineering</td>
<td>Massachusetts Institute of Technology USA</td>
</tr>
<tr>
<td>1905</td>
<td>London</td>
<td>Imperial College of Science &amp; Technology</td>
<td>Civil and Mechanical Engineering</td>
<td>Imperial College, London</td>
</tr>
</tbody>
</table>

**Table - 4 : Pioneering Technical Schools and Colleges in Europe, USA and Germany**


Many schools and colleges were also setup in other countries. Engineering schools and colleges which were setup in the developed countries from 18th & early 20th century.

In the beginning, engineering education was confined to the two branches namely civil engineering and mechanical engineering while electrical engineering was started from 1882 only.

The expansion of technical education in the 19th century had witnessed the birth of many branches like mining, shipping, textile, printing etc. Since, then, engineering profession is constantly changing as well as developing at a rapid rate. Its growth is never ending and becoming more and more complex.

**Development under British rule (Pre Independence period) in India**

If we examine the historical development of technical education, it will be discovered that the foundation of technical education in India was laid almost at the same time as in Europe but its growth in India was very restrictive and slow till India became Independent. Soon, after the battle of Plessey in 1754, the status of presence of Britishers was changed from traders to colonizers. Therefore, to rule the country, it was essential that they should have an intimate knowledge of the country’s topography through physical survey of the land. For achieving this object, the English traders established a survey school in Madras (Chennai) in 1794 to train Indian personnel in land survey to assist British Surveyors\(^1\).

So, it is worth mentioning that the British started first the technical education programmes in India with training to overseers on construction of roads, bridges, buildings, railways, canals, and docks, etc. Simultaneously, lower grade technicians were also trained in the use of measuring and survey equipments needed for army, navy and other technical establishment for maintenance of a colony of the British crown. The instructors for those training schools were mostly British except the lower grade instructors like craftsman and artisans from local population.\(^2\)

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### Table – 5 Pioneering technical schools and colleges in India

<table>
<thead>
<tr>
<th>Year</th>
<th>College Name</th>
<th>Branch</th>
<th>New Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1847</td>
<td>Thompson’s Engg. College, Roorkee</td>
<td>Civil</td>
<td>Roorkee University IIT, Roorkee</td>
</tr>
<tr>
<td>1856</td>
<td>Calcutta College of Civil Engg., Writers building</td>
<td>Civil Mechanical (1931), Electrical(1939)</td>
<td>Bengal Engg. College</td>
</tr>
<tr>
<td>1858</td>
<td>Poona College of Engg.</td>
<td>Civil</td>
<td></td>
</tr>
<tr>
<td>1858</td>
<td>Industrial School, Gun Carriage Factory</td>
<td>Civil</td>
<td>Guindy College of Engg.</td>
</tr>
<tr>
<td>1887</td>
<td>Victoria Jubilee Technical Institute, Bombay</td>
<td>Electrical Mechanical, Textile</td>
<td></td>
</tr>
<tr>
<td>1908</td>
<td>College of Engg. And Technology, Jadavpur</td>
<td>Mechanical(1908) Chemical(1921)</td>
<td></td>
</tr>
<tr>
<td>1915</td>
<td>Indian Institute of Science, Bangalore</td>
<td>Electrical</td>
<td></td>
</tr>
<tr>
<td>1917</td>
<td>Banaras University</td>
<td>Mechanical, Electrical, Metallurgy.</td>
<td></td>
</tr>
</tbody>
</table>

Source: Enhancing Teaching Effectiveness of Technical Teachers. Indian Journal of Technical Education.

So, we can say that the growth and development of formal technical education in India has come a long way since its inception in the 19th century under British rule. It expanded multifold after India attained its Independence and it is still progressing\(^1\).

The need for introduction of occupation education was highlighted in 1854 in a document submitted to the British Government known as Wood’s Despatch”. The famous Wood’s Despatch from the Court of Directors, no. 49 dated 19th July 1854) which envisaged an “Enlarged System of Education to be Pursued in India” prompted the then Governor General of India, Lord Dalhousie, to recommend to the court of Directors for the establishment of an engineering class at each Presidency.

Technical education developed at two separate levels- one represented by colleges or universities and the other by schools. But technical education received its

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importance from 1940 onwards when this kind of education was being considered essential for better earnings.1

At the school level, it is stated that the engineering schools existed in Calcutta (Kolkata) and Bombay (Mumbai) as early as 1825 but the first authentic account that we have is of an industrial school established at Guindy, Madras in 1840 by Major Maitland, superintendent of the Gun Carriage Factory.

It was a novel industrial school known as “School of Ordnance Artificers”. In 1842, James Thomson, the lieutenant governor of North Western Province, first of all proposed the establishment of College of Civil Engineering at Roorkee to train engineering personnel at various levels for public works of the country. It also included the construction work of Ganga Canal. Thus, the Roorkee College was established in 1847 to train Civil Engineers. When James Thomson died in 1853, the Roorkee College was renamed as Thomson College of Civil Engineering in 1854. In 1948, the Roorkee University Act was passed and in 1949, the status of this college was further enhanced and the Roorkee Engineering College became first Technical University of India. After completion of 150th year of existence, the Institute has been given the status of Indian Institute of Technology (IIT) in 2003.2 It was direct product of irrigation and other engineering schemes undertaken by the government and was placed on a permanent footing in 1849, continued to serve as a model for future expansion of technical education in India.3 It made use of the nearby large workshops and public buildings which were erected for the Upper Gangas Canal.

The Roorkee college was never affiliated to any university but has been offering diplomas which are considered equivalent to any university degree.

In 1854, a school for the training of overseers was established in Pune. ‘Poona Engineering Class and Mechanical School' to train subordinate officers for carrying out public works like buildings, dams, canals, railways and bridges. Later on, the school became the 'Poona Civil Engineering College', and subsequently in the year 1911, the name was changed to the 'College of Engineering, Poona'. (Now College of Engineering, Pune (COEP)) Established in 1854, it is the third oldest engineering

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college in Asia, after the College of Engineering, Guindy (1794) and IIT Roorkee (1847). The students and alumni of COEP are colloquially referred to as COEPians.

In November 1856, a college called the Calcutta College of Civil Engineering was opened at the Writers’ building. The name was changed to Bengal Engineering College in 1857. It gave a licentiate course in Civil Engineering. In 1865, it was amalgamated with the Presidency College. Then it shifted to Sibpur in the premises and building belonging to the Bishop’s College.

In 1866, College of Engineering, Poona got affiliated to the Bombay University. The educational work in these colleges of Guigy (Now Guindy), Sibpur and Poona licentiated courses in Civil Engineering in 1880. After 1880, the demand for mechanical and electrical engineers was also felt, but they started only apprenticeship classes in these subjects.

In 1887, through private initiatives, the Victoria Jubilee Technical institute was established in Bombay (Now Mumbai) to commemorate the diamond Jubilee of Queen Victoria Reign. The main objective of V.J.T.I. was to train licentiates in electrical, mechanical and textile engineering and technology.

At lower levels, there was a widespread use of jobbers (people who supplied labour) for hiring workers and maintaining discipline. The workers themselves were a completely unskilled group who had to bribe the jobbers to get and retain their jobs. There were also problems of race, language and caste distinction between management, supervisors and workers. The demand for technical education started emerging from this time onwards.

From 1902-1921, realising the importance of technical education for the development in the country, Indian Education Policy (1902) advocated a speedy growth of technical education. During this period, the government of India did not pay any attention towards technical and professional education. However, the recommendations of Indian Education Commission were accepted and technical and vocational subjects were included in the curricula of high schools in different provinces.

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In 1906, the first twentieth century College of Engineering and Technology was established at Jadavpur in Bengal by the National Council of Education. This college started to grant diploma courses (Polytechnical Education) in mechanical and electrical engineering courses in 1908 and chemical engineering courses in 1921 respectively.

In the meantime in 1911, Sir Jamshed Tata established the Indian Institute of Science at Bangalore.

In 1913, Government Resolution on Educational Policy made recommendations for inclusion of subjects of industrial importance in the curriculum. Hartog Committee (1928-29) suggested the diversion of more boys to industrial and commercial careers at the end of middle stage, for which provision should be made by alternative course in that stage.

In 1915, the Indian Institute of Science, Bangalore, opened Electrical Engineering classes under Dr. Alfred Hay, and began to give certificates and associateships, the latter being regarded equivalent to a degree.

In 1916, Banaras Hindu University was established.

In 1917, Calcutta University Commission debated the pros and cons for introduction of degree courses in mechanical and electrical engineering.

In this context, they took shelter under the recommendation of Indian Industrial Commission (1915) under the chairmanship of Sir Thomas Holland, which was not in favour of starting any new course. In these areas as there was no opportunity for employment of electrical engineers in the absence of manufacturing activities in this area.

In 1919, Pt. Madan Mohan Malviya established College of Banaras which introduced degree classes in mechanical, electrical engineering and metallurgy.

In 1920, Harcourt Butler Technological Institute was established.

From 1920 onwards, there has been a great demand of the establishment of technological institutions by Indians since they wanted to avoid the need of going abroad for such courses.


In 1921-1937, a number of such institutions were set up e.g., The Indian School of Mines, Dhanbad; The Harcourt Technological Institute, Kanpur; and The School of Chemical Technology, Bombay¹.

From 1931-1940, different colleges named Bengal Engineering College, Sibpur, Guindy and Poona started mechanical, electrical and metallurgy courses.

By 1939, at the outbreak of Second World War, there were not more than ten or eleven engineering colleges in India each with one annual intake of about 200 students².

The Abbot-Wood Report, 1936-37

Two expert advisors, Messrs. A. Abbot, formerly Chief Inspector of Technical Schools, Board of Education, England and S. H. Wood, Director of Intelligence, Board of Education, England, were invited to advise the government on certain problems of educational reorganization and particularly on problems of vocational and technical education. One of the basic reasons for instituting the enquiry was because of the fact that a large number of university graduates were unable to secure employment of a kind for which they received education. The report of Messer’s Abbot and Wood recommended major reforms in the educational system by suggesting a complete hierarchy of vocational and technical institutions parallel to that of institutions imparting general education³.

On the basis of their recommendations, a new type of technical institutions called “Polytechnics” came into existence for training of middle level technical personnel⁴.

Delhi Polytechnic (1941) which has now been converted into an Engineering College was the first in the chain of such polytechnics. In 1941-42, only 264 students were studying in graduate courses of technical education and 22 students in chemical technology respectively⁵.

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³ http://www.education.nic.in/cd50years/g/W/16/0W160301.htm (Accessed on 06.07.2010)
Technical Education Committee of the Central Advisory Board of Education (1943) and the Sargent Report (1944) also recommended the development of institutions as an integral part of national system¹.

The Government of India realized that it was necessary for the centre to support, coordinate and promote research in technical education. Crucial decision for the technical education was reflected through the most comprehensive plans for the organization of technical education on an All –India basis. The most vital was the creation of the Board of Scientific and Industrial Research in 1940 to promote industrial research. Second was the establishment of Delhi Polytechnic in 1941.

Thirdly in 1945, an adhoc committee, popularly known as Sarkar Committee was appointed for advising on the lines of the Massachettues Institute of Technology (MIT). The Committee recommended that not less than four (Zone wise in North, South, East and West) higher technical institutes would be required to satisfy the post war requirements.

Fourthly, on 30th November, 1945, the All India Council for Technical Education (AICTE) was set up by a resolution of the Government of India on the recommendation made by Central Advisory Board of Education (CABE)².

Lastly in March 1947, Scientific Manpower Committee was appointed to assess the country’s requirements for different grades of the scientific and technical personnel during the next ten years and to recommend the measures to meet them. The Committee carried out a quantitative and qualitative assessment, according to which as many as 54,000 engineers and 20,000 technologists would be required for the period. This committee for the first time in the country, introduced the concept with a capacity to predict the future requirements for manpower and to meet through an organized effort.

The pre-independence era witnessed the establishment of various technical institutes that provided the base for extending it further in future. The drop back was set well with 38 institutes offering degree courses with a total admission capacity of 2,940 students and the output of graduates being 1,270 students. Number of institutions offering diploma courses were 53 with a total admission capacity of 3,670 students and the output of graduates being 1,440 students. There was a lack of post

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graduates studies and research in engineering despite a number of technical institutions.

**Post Independence Era**

Period from 1944 to 1947 was a turning point of transition in the technical education.

In 1948, AICTE with the help of Board of Studies reviewed the situation of polytechnic education in India. It laid down the norms for accommodations, workshops, laboratory and staff required. After the year 1950, most of the polytechnics have strictly followed these norms.

**Technical Education: 1947-1987** - Soon after the attainment of Independence, the government of India appointed a commission in November, 1948 under the chairmanship of Dr. S. Radhakrishnan, Professor of Eastern Religions and Ethics at the University of Oxford to report on Indian University Education and suggested improvements and extensions that may be desirable to suit present future requirements of the country”. In the field of technical education, the Radhakrishnan Commission emphasized the need for new types of engineering and technical institutes in India. It advocated closer liaison between engineering and technical colleges and the Universities. It also made the significant recommendation to improve the quality and quantity of different classes of engineering and technologies in the country.

Advisory panel of Engineers and Technologists was set up to advocate suggestions for the development of technical education. The Constitution of India which heralded the world’s biggest “Sovereign Democratic Republic” on 26th January, 1950 recognised the supreme importance of technical education for the future development of the country.

In 1958, due to recommendations of National Development Council, the Planning Commission decided to appoint working groups on different subjects in order to consider the various issues relating to the third Five Year Plan.

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In 1959, the Working Group on Technical Education and Vocational Training was appointed under the chairmanship of Prof. M.S. Thacker, the then Secretary, Ministry of Scientific Research and Cultural Affairs. The Working Group made tremendous efforts for the development of technical education in the third and subsequent Plans\(^1\). It made an intensive study of the existing facilities for technical education and training in India, and made far reaching recommendations for the qualitative as well as quantitative improvement of technical education and training facilities in the country. These recommendations are as follows:

- It is recommended that the intake capacity of Engineering Colleges and Polytechnics should be gradually increased to an optimum size.
- The location of Engineering Colleges as well as Polytechnics should be as near industry areas as possible.
- The number of scholarships in the Engineering Colleges and Polytechnics should be substantially increased.
- In order to reduce wastage and stagnation in technical institutions, it is suggested that a liberal scheme of scholarships may be introduced and other facilities like hostel accommodation etc. may be provided on large scale.

**The Apprentices Act of 1961** was approved by the Central Government in consultation with Central Apprenticeship Council\(^2\).

Under this Act, a voluntary scheme known as “Programme of Apprenticeship Training” was arranged by the Ministry of Education, GOI. The object of this scheme was to provide practical training facilities to unemployed engineers and diploma holders (Polytechnics) in order to furnish them for gainful employment in industry\(^3\).

In 1964, Education Commission popularly known as Kothari Commission was appointed under the chairmanship of Prof. D.S. Kothari. It is a landmark in the development of technical education in India. Greatest and sincere efforts were made to vocationalise and specialize the technical education at Polytechnic level. It was recommended that polytechnic institutes should be established for those students who have passed secondary school classes. Part time training or correspondence courses


should be arranged for industrial training to benefit those children who are mostly
generated in domestic work.

In 1967, Govt. of India appointed a Committee of Members of Parliament to
prepare the draft of a statement on National Policy on Education. This Committee
made a significant remark that practical training should be given to technicians and
they should be given a better status in Industry and in society.

In 1968, the document on “National Policy on Education”, which was published
by the Government of India, mostly reiterated the recommendations of the Committee
of Members of Parliament on Education\(^1\).

In the last four decades since Independence, there was a phenomenal expansion
of technical education in India at the Polytechnic Diploma level after the
Independence of the country. In 1947, there were only 53 diploma level and 38 degree
level courses in technical education and they could admit only 3,670 students each
year\(^2\).

In 1970-71, however, there was widespread criticism of the system of
Polytechnic education prevailing in the country. It was felt that the diploma courses in
our polytechnics were “mostly theoretical with very little practical bias”.

So, to make polytechnic education more practical, Govt. of India on the advice
of AICTE, constituted a “Special Committee for Re-organisation and Development of
Polytechnic Education” under the Chairmanship of Prof. G.R. Damodaran popularly
known as Damodaran Committee\(^3\).

This Committee looked into all aspects of technical education and suggested
consolidated and quality improvement programmes of polytechnic education,
autonomy of state boards, examination reforms, sandwich courses, entrepreneurship
programmes were major reforms recommended by the Committee. Like, many other
reports, this too was only partly implemented because several states did not agree to
follow many of the recommendations\(^4\).

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3 Report of the Special Committee on Reorganisation and Development of Polytechnic Education in India 1970-71, Part-I and II. New Delhi, Ministry of HRD, p.2.
This Committee highlighted the importance of Polytechnic Education and covered the different aspects and areas of Polytechnic Education under Five Year plan (FYP).\(^1\)

In 1973, the Apprentices Act (1961) was amended with a view to bringing within its purview the training of engineering graduates and diploma holders. It continued to be implemented to train the trainees at Kanpur, Bombay, Calcutta and Madras. In the end of 1982, 11,500 trainees (3,500 Engineering graduates and 8,000 Diploma Holders) were in position\(^2\).

In 1974, a Committee named as Kelkar Committee was appointed to review the performance of Technical Teacher Training Institutes (TTTIs) and to make suggestions for their future plan and development. As a consequence, 4 TTTIs at Bhopal, Calcutta, Madras and Chandigarh were established to provide in-service training to polytechnic teachers and also engaged in educational film production, preparation of instructional packages etc. under a United Nations Development Programme (UNDP) project.

In 1976-77, a scheme named “Direct Central Assistance” was started to select Engineering Colleges and Polytechnics in order to bring about qualitative improvement in the standard of technical education in the country. Under this scheme, the important projects were identified on the approval of AICTE (All India Council for Technical Education)\(^3\).

Government of India from time to time has taken keen interest in developing the community polytechnic which aims at sustainable community development without environmental degradation by way of science and technology applications for socio-economic upliftment and improvement in the quality of life of common man through micro level planning and people’s participation at the grass root level.

In 1977-78, several community polytechnic were initiated for establishment of Community Development Cells within the polytechnic campuses and with extension arms in rural areas for contributing relevant technologies and reorient their own training programmes based on the feedback from rural areas. As on March 1996, 375 Community Polytechnics were functioning all over the country out which 74 were

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\(^1\) Report of the Special Committee on Reorganisation and Development of Polytechnic Education in India 1970-71, Part-I and II. New Delhi, Ministry of HRD, p.55.


exclusively for women. During this period, it has trained 4,50,000 out of which about 60% are self employed. It offers about 100 technical/vocational trades

**During the year 1982-83**, two National Experts Committee selected 12 Engineering Colleges and 22 Polytechnics for grant of assistance involving a total expenditure of Rs. 111 Lakhs.


This Working Group also emphasized the need for continually reviewing the system of technical education for “Harnessing Science and Technology to profitable and productive processes of economic growth and social well being”.

**In 1979**, the Government of India (GOI) published a new “Draft National Policy on Education, 1979” which advocated the need for creation of a machinery for dissemination of information relating to manpower needs in the field of technical education especially in “Polytechnics”.

Foreign Technical Assistance received from friendly countries contributed a great deal to the development of technical education in India, during the last three decades. It has enabled the technical institutions in the country “to develop expertise of international standards and to build up competent Research and Development infrastructure in a wide variety of scientific and technological fields.”

In order to assess the impact of foreign technical assistance on the development of technical education, The Ministry of Education, GOI appointed a Review Committee in June, 1978 under the Chairmanship of Dr. A. Rama Chandaran, the then Secretary, Department of Science & Technology.

Prof. Nayundamma, former Director General of Council of Scientific and Industrial Research was appointed as Chairman of the Review Committee. It was

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suggested that this Committee should examine how the IIT’s could offer technical assistance to academic institutions of lower formations such as engineering colleges\(^1\).

Another Committee was also appointed by the GOI in 1978 to review the progress so far made in the area of post graduate education and research in engineering and technology and to report on all aspects of its further development.

Once again, Prof. Y. Nayudamma, distinguished Scientist and Former Director General, Council of Scientific and Industrial Research, was selected as a Chairperson of this review committee\(^2\).

**From 1978-79 onwards**, development programmes were carried on by different organizations and councils in the field of polytechnic education. Role of Five year plan also highlighted in this period.

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**Table - 6 Summary of Major Committees and Recommendations**

<table>
<thead>
<tr>
<th>Committee</th>
<th>Title</th>
<th>Year</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarkar Committee</td>
<td>Higher Technical Institutions for the Post-war Industrial Development</td>
<td>1945</td>
<td>Setting up of Indian Institutes of Technology</td>
</tr>
<tr>
<td>Thacker Committee</td>
<td>Postgraduate Engineering Education and Research</td>
<td>1959-61</td>
<td>Funding for 100 Ph.Ds annually</td>
</tr>
<tr>
<td>Nayudamma Committee</td>
<td>Postgraduate Education in Engineering &amp; Technology</td>
<td>1979-80</td>
<td>*PG Minimum Qualifications for Industry, R&amp;D, etc.</td>
</tr>
<tr>
<td>Nayudamma Committee</td>
<td>IIT Review</td>
<td>1986</td>
<td>*Greater flexibility in Academic Programme, *Focus on Engineering Research, *Faculty Mobility</td>
</tr>
</tbody>
</table>

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\(^1\) Report of the Review Committee on Foreign Technical Assistance Received by the Indian Institute of Technology and other Academic Institutions (1980). New Delhi. P.3

<table>
<thead>
<tr>
<th>Programme</th>
<th>Strategic Road Map for Academic Excellence of Future RECs</th>
<th>1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.A. Mashelkar Committee</td>
<td>*Conversion of RECs in NITs with the status of a Deemed to be University and structural changes in governance</td>
<td></td>
</tr>
<tr>
<td>U.R. Rao Committee</td>
<td>Revitalizing the Technical Education</td>
<td>2003</td>
</tr>
<tr>
<td></td>
<td>*Regional inequity to be removed *Faculty shortage to be addressed *Need for planning and coordination in the working AICTE</td>
<td></td>
</tr>
<tr>
<td>P.Rama Rao Committee</td>
<td>IIT Review</td>
<td>2004</td>
</tr>
<tr>
<td></td>
<td>*Increase UG output of IITs *Fund Infrastructure increase *A new IITs but maintain quality</td>
<td></td>
</tr>
</tbody>
</table>

Development Programmes For Polytechnic Colleges During Five Year Plans

Education is the most crucial investment in human development. The excellence of our university products and professionals is well acknowledged both at home and abroad. The competitive advantage of the country can be maintained and improved only if the university and technical education sectors perform well. Right from the inception of planning, the crucial role of education in economic and social development has been recognized and emphasized. Effect to diversity educational programmes in order to promote knowledge and skills required for nation building have characterized successive five year plans. An attempt is made in this part of the present study to examine some emerging issues relating to technical education with special reference to polytechnic programmes during Five Year Plans¹.

The growth and development of technical education in India during the pre-Independence and post-Independence periods is that whereas during the earlier period, the growth was haphazard and erratic, during the post independence period, it has been more organized and planned on scientific lines. The realization and development of technical education as essential to meet the technological needs of the country, made it an area of high priority in economic planning. Technical education plays a significant role and can be considered as backbone for the economic progress and development of any nation. This fact has been realized by the education planners and emphasis on the development of technical manpower was given right from the first five year plan.²

Therefore, each successive Five Year Plans (FYP) laid emphasis on certain particular aspects of technical education³.

The technical education from 1947-1987 had been a period of steady growth for the technical education in India. This period also comes under the first 7th FYP with the National Policy on Education (NPE), 1986. The Central Government continues to play the lead role in the evolution and monitoring of educational policies and programmes, the most notable of which are the National Policy on Education (NPA), 1986 and the Programme of Action (POA), 1986 as updated in 1992. The modified policy envisages a National System of Education to bring about uniformity

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in education and strengthening of the All India Council for Technical Education. Though, the growth of modern technical education has been much faster after India became Independent\(^1\). At this time, it is necessary, not only, to assess the quantitative growth of technical education but also, to focus on the other aspects, related to qualitative aspects, the impact of privatization and foreign aid for the purpose.

During the first three Five Year Plans, there was emphasis on the expansion of technical education to meet the country’s demand for technical personnel at the diploma, degree and post graduate level.

**First Plan Period : (1951-56)**

In this period, the Central Government established the Indian Institute of Technology, Kharagpur which was declared by an Act of Parliament as an Institute of National Importance in 1957.

The Indian Institute of Science, Bangalore was further developed for the post graduate studies in Engineering and in 1959, it was to be a deemed University under the statutory provision of University Grants Commission (UGC).

**Second and Third Plan Period : (1956-61, 1961-66)**

During the 2\(^{nd}\) Plan, Institutes of Technology were also established at Madras, Bombay (now Chennai and Mumbai) respectively and Kanpur. The post graduate courses in Industrial Engineering and Industrial Management were started at the Indian Institute of Technology, Khargpur, Victorial Jubilee Technical Institute (VJTI) Mumbai and the Indian Institute of Science, Bangalore. The Administrative Staff College was established at Hyderabad as a joint and cooperate enterprise of government and private industry and commerce for the training of senior administrators.

At this time, there was only one institute for the training of technical teachers at Bilaspur that was established by Ministry of Labour. During the 2\(^{nd}\) Five Year Plan, Ministry of Iron and Steel had set up a directorate of training to coordinate the personnel requirements of steel plants and to arrange for the necessary training facilities. The private enterprise played a vital role, as in 1960, 296 institutes for first

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\(^1\) Opt. Cited. Singh, B.K. p.726
degree and 177 diploma courses were set up by Central and State Governments and 31 by universities and 88 by private agencies. A definite policy was followed by Central Government to encourage and assist the private agencies.

Table – 7 : Central Government Funded Institutions in India

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Institutes</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Indian Institute of Technology (IITs)</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>Indian Institute of Management (IIMs)</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>Indian Institute of Science (IISc) Bangalore</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Indian Institute of Science Education &amp; Research (IISERs)</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>National Institute of Technology (NTTs)</td>
<td>20</td>
</tr>
<tr>
<td>6.</td>
<td>Indian Institute of Information Technology (IITs)</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>National Institute of Technical Teachers Training &amp; Research (NITTTTRs)</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>School of Planning &amp; Architecture : (SPA), New Delhi</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>Indian School of Mines University (ISMU), Dhanbad</td>
<td>1</td>
</tr>
<tr>
<td>10.</td>
<td>North Eastern Regional Institute of Science &amp; Technology (NERIST) Nirjul (Andhra Pradesh)</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>Sant Longowal Institute of Science &amp; Technology (SLIET), Longowal (Punjab)</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>National Institute of Industrial Engineering (NITIE), Mumbai</td>
<td>1</td>
</tr>
<tr>
<td>13.</td>
<td>National Institute of Foundry &amp; Forge Technology (NIFFT), Ranchi</td>
<td>1</td>
</tr>
</tbody>
</table>

Source : [http://www.education.nic.in/tech/tech_overview.asp](http://www.education.nic.in/tech/tech_overview.asp)  
(Accessed on 23.10.2010)
**The Rising of RECs (Regional Engineering Colleges)**

During the second five year plan (1956-60) in India, a number of industrial projects were contemplated. To ensure enough supply of trained personnel to meet the demand for these projects, the decision was taken to start Regional Engineering Colleges (RECs) at the rate of one per each of the major state, which can churn out graduates with good engineering merit.

On the recommendations of the Engineering Personnel Committee (1955) Regional Engineering Colleges were established from 1959 onwards in each of the major states. Each college was a joint and cooperative enterprise of the central government and the concerned state government. Table-8 is screening year wise establishment of RECs in the different places of India.

**Table – 8 Year Wise Establishment Of RECS In Different Parts Of India**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>State</th>
<th>City</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Andhra Pradesh</td>
<td>Warangal</td>
<td>1959</td>
</tr>
<tr>
<td>2.</td>
<td>Mysore (now Karnataka)</td>
<td>Surathkal</td>
<td>1960</td>
</tr>
<tr>
<td>3.</td>
<td>Maharastra</td>
<td>Nagpur</td>
<td>1960</td>
</tr>
<tr>
<td>4.</td>
<td>Madhya Pradesh</td>
<td>Bhopal</td>
<td>1960</td>
</tr>
<tr>
<td>5.</td>
<td>West Bengal</td>
<td>Durgapur</td>
<td>1960</td>
</tr>
<tr>
<td>7.</td>
<td>Jammu &amp; Kashmir</td>
<td>Srinagar</td>
<td>1960</td>
</tr>
<tr>
<td>8.</td>
<td>Uttar Pradesh</td>
<td>Allahabad</td>
<td>1961</td>
</tr>
<tr>
<td>9.</td>
<td>Orrissa</td>
<td>Rourkela</td>
<td>1961</td>
</tr>
<tr>
<td>10.</td>
<td>Kerala</td>
<td>Kozhikode (Calicut)</td>
<td>1961</td>
</tr>
<tr>
<td>12.</td>
<td>Rajasthan</td>
<td>Jaipur</td>
<td>1963</td>
</tr>
<tr>
<td>13.</td>
<td>Haryana</td>
<td>Kurukshehra</td>
<td>1963</td>
</tr>
<tr>
<td>14.</td>
<td>Tamilnadu</td>
<td>Tiruchirapalli</td>
<td>1964</td>
</tr>
<tr>
<td>15.</td>
<td>Assam</td>
<td>Silchar</td>
<td>1973</td>
</tr>
<tr>
<td>17.</td>
<td>Himachal Pradesh</td>
<td>Hamirpur</td>
<td>1987</td>
</tr>
</tbody>
</table>

Three Indian Institutes of Management were established at Ahmedabad, Bangalore and Calcutta respectively in 1961, 1962 and 1972 to provide facilities for the training in Management and improving Management practices. Graph - 2 depicts the growth of engineering colleges and Polytechnics after Independence, also covering the first three FYPs.

Graph – 2

**During the 4th PLAN (1969-74),** there was selective expansion in post graduate education and an attempt to consolidate other programmes. The 4th FYP onwards, the policy was shifted towards improving the quality and standard of technical education through implementation of Quality Improvement Programme, curriculum design and development and collaboration with users in the entire system.

During this period, the expansion of institutes and intake remained at a very low level in the government, private aided and university sector.

The Kothari Commission Report 1964, Damodar Committee Report 1970, and Madan Committee Report 1970 have highlighted the areas of concern to ensure the quality of technical education\(^1\).

**Quality Improvement Programme**

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There are schemes/programmes such as the Third Technician Education Project and Technical Education Quality Improvement Programme (TEQIP) assisted by the World Bank, which are engaged in bringing out systematic improvements in the technical education sector. The programme was launched by the Ministry of Human Resource Development, in December 2002. The TEQIP aims at up-scaling and supporting the ongoing efforts of the Government of India. By improving quality of technical education and enhancing existing capacities of the Institutions to become dynamic, demand-driven, quality conscious, efficient and forward looking, responsive to rapid economic and technological developments occurring both at national and international levels.

The TEQIP programme launched in March 2003, is being implemented as a centrally coordinated, multi-state, long term programme in overlapping phases.\(^1\)

To improve the quality and standard of technical education system particularly Polytechnics, this programme plays an important part in the faculty development and curriculum development in Polytechnic institutes.

**Community Polytechnics**

In June 1981, the Ministry of Education, Govt. of India published “A Guideline Documents on the Scheme of Community Polytechnics in India” which was started during 1978-79 on the recommendations of AICTE.\(^2\)

These Polytechnics which have shown initiative to interact with environment by organizing programmes and activities, to meet the needs of the community should be selected as focal points to promote transfer of technology to the rural sector. The council recommended that these polytechnics should be designated as Community Polytechnics and given adequate support to carry out their tasks.

**During the years 1978-81**, 35 Polytechnics in the country were selected as Community Polytechnics and charged with the responsibility of accelerating rural development on scientific lines.

The criteria for selection of Community Polytechnic as laid down by the Ministry of Education, Govt. of India, “Envisaged that such Polytechnics should be in

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a position to function adequately and effectively in a number of areas which we
directly concerned with rural development and need technological inputs.”

For this purpose, the following areas were broadly identified:

Agriculture, Housing and Shelter, Water Supply and Irrigation, Road and
Village Transport, Electrification, Promotion of Agro-Industries, Small Scale and
Village Industries, Development of Human Resources and Training of Manpower in
technical Courses/ Vocations, Public Health and Sanitation.

The Scheme of Community Polytechnics has been a great success. The
involvement of these Polytechnics in rural development work has been proved beyond
doubt that they have become major instruments in bringing about socio-economic
transformation to the rural areas of the country. These Community Polytechnics have
become an effective change agent in increasing productivity, generating employment
and improving life style of rural masses and above all in promoting coordinated
development according to well chalked out plans with built in mechanism for
monitoring, feedback for timely corrective measures and optimization

**Advanced Technician Course**

It was another such programme initiated by the Union Ministry of Education
since 1981-82 on the recommendation of AICTE. The main objective of this
programme/scheme is to provide avenues of advancement to technicians having only
a diploma and also to provide higher courses at advanced level to enable the
technicians to advance professionally in their own lines.

**Sixth Five Year Plan(1980-85)**, focused on teacher education and curriculum
development. Technical Teacher Training Institutes were set up at Madras, Calcutta,
Bhopal and Chandigarh in 1966-67. Cooperation between industrial and technical
education was emphasized by the Kothari Commission 1964-66 and various other
Committees and Working Groups on technical education appointed by the Govt. of
India from time to time.

During this plan, Ministry of Education, Govt. of India initiated several other
new schemes for the improvement of standard and quality of technical education in
the country e.g. National Manpower Information System, Technical Institutions –

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   Education, New Delhi.pp.3-4
Society Interaction, Special Model Projects on correspondence Courses, Development of Self-Reliance and Product Development, New Quality improvement Programmes etc.

In 1971, National Institute of Foundary and Forge Technology was established at Ranchi and National Institute for Training in Industrial Engineering in Bombay (Now Mumbai).

During the Seventh Plan Period (1985-90), AICTE recommended that it is necessary to restructure Polytechnic Education.

The Technical Education system of the country is designed to meet the technological needs of the developing economy. Short-term and long-terms programmes for development of Technical Education are drawn up for implementation during the Five-Year plans launched by the Government. The economic prosperity of a country depends mostly upon its technological capabilities and by industrialisation. Education training, retraining and updating of technical personnel in the emerging areas of Engineering, Science and Technology play a vital role for the development of the country and have, therefore, to be given high priority in economic planning. It is the responsibility of the department concerned with training of technical manpower to evolve scheme to ensure regulated development of technical education in the state by evolving suitable programmes for consolidation of the existing projects and by evolving new schemes for introduction of such courses or starting of such institutions as would ensure supply of requires technical manpower to fill the gaps or to meet the demands of the industry in the newer areas of specilisation in the fields of science, engineering and technology. The importance of technical education has grown in the past ten years in the country. The Department of Technical Education has been actually involved in implementing the schemes for starting new institutions or introduction of new courses over the past one decade.

During this plan period, AICTE recommended that it is necessary to restructure polytechnic education. It was also the time when National Policy on Education (NPE) 1986, highlighted the need for reorganising the technical and management education system to effectively deal with the management processes and rapid expansion of knowledge, and advances in science and technology. The NPE laid specific guidelines for the qualitative and quantitative development of technical and management education sectors, establishment of linkages amongst the concerned agencies, manpower assessment and technical education’s forecasting, increasing
effectiveness of the technical education management system. It lead to the extraordinary growth of technical education system at that point of time and continued further\(^1\).

**National Approach**

The draft 7\(^{th}\) Five Year Plan of Technical Education approved by the Working Group of Ministry of Education and Culture, Government of India, briefly gives an account of the out-line for the 7\(^{th}\) Five Year Plan as follows:-

The schemes started in the 6\(^{th}\) Five Year Plan and the previous Five Year Plans will have to be continued and strengthened during the 7\(^{th}\) Five Year Plan period for proper development of Technical Education and also for improvement of quality and standards in the fields. These schemes, however, would not be adequate to meet the challenges and in order to deal with all the problems in an adequate way in the context of the development of Technical Education, will have to be introduced in the 7\(^{th}\) Five Year Plan period.

There are a few areas, which are highly important and significant to tone up and revitalize the system of Technical Education in the country. These shall be the major trust areas, during the 7\(^{th}\) Five Year Plan period. Besides, there are a number of other areas, which are also important for the improvement of quality and standards of Technical Education, which is the crux of the problem. Adequate attention will have to be paid to these areas also during the 7\(^{th}\) plan period.

In order to meet these challenges, various schemes were instituted during the 7\(^{th}\) Five Year Plan period\(^2\).

**State Approach**

Keeping in view the guidelines for the 7\(^{th}\) Five Year Plan period formulated by the Government of India, the approach to the 7\(^{th}\) Five Year Plan at the State level were as follow:-

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\(^1\) [http://planningcommission.nic.in/plans/planrel/fiveyr/welcome.html](http://planningcommission.nic.in/plans/planrel/fiveyr/welcome.html) (Accessed on 18-04-2010)

1. To have a look back at the progress of the schemes implemented during the earlier plan period and assess the lagging deficiencies that have to be made up for consolidation.

2. To meet the spill-over requirements of the schemes taken up and implementation of VI Five-Year plan.

3. To consolidate the existing institutions by providing the necessary physical facilities like buildings, workshops, laboratories, hostels etc.

4. To replace the obsolete and worn out requirement in the institutions and modernize the workshops and laboratories with new and sophisticated machinery and equipment, currently in use in the industry.

5. To re-organize the institutions by having a fresh look at the curricular requirements of the courses, staff pattern, their capacity to undertake schemes for resource generation, socio-economic development, production-cum-training centers, consultancy transfer of technology to rural areas, etc.

6. To formulate new schemes and consider establishment of new institutions to meet the requirement of technical manpower in the context of industrial growth in the country in general and the concerned state in particular subject to the guidelines prescribed by the All India Council For Technical Education from time to time.

7. To introduce Advance Technicians Course (Post-Diploma) in polytechnics in the new and narrow specializations with limited intake and minimum investment on basic training facilities.

8. To draw schemes for introduction of more sandwich courses so as to actively involve, the industry in the training programmes and provide opportunity to the teachers and the taught to acquaint themselves with the current production techniques and progress in the related industry.

9. To identify more polytechnics and provide for being developed as community polytechnics and provide Direct Central Assistance.
10. To strengthen the administration at State Directorate level for exercising greater and effective control over the institutions\(^1\).

\(^1\) [http://www.planningcommission.gov.in/plans/planrel/fiveyr/7th/vol2/7v2ch18.html](http://www.planningcommission.gov.in/plans/planrel/fiveyr/7th/vol2/7v2ch18.html) (Accessed on 29-10-2010)
**Proposals**

In addition to the spill-over, the following new schemes were taken up during the 7th Five-Year plan period by the Department of Technical Education keeping in view the National and State approaches.

**a)** In order to meet the long time demand of the Engineering Diploma holders for providing facilities for vertical mobility, it started additional 4 year part-time and 3 year full time Degree courses specially designed for diploma holders in various Engineering Colleges.

**b)** In view of the demand for admission into women’s polytechnics in the State and the growing importance for women’s education in India, it is proposed to establish at least one Women’s Polytechnic for every 2 districts was established.

**c)** State wise institutes are proposed to be set up at various places.

As most of the polytechnics in the State were started during 3rd Five-Year plan or earlier most of the equipment in the workshops and laboratories had become obsolete and worn-out and there is need to replace most of the equipment and also to modernize laboratories and workshops. Sufficient provision will be made for the scheme of modernization of the laboratories and workshops of the polytechnics.

Many institutions did not have permanent buildings, workshops and laboratories, particularly those institutions which were started during the VI Five-Year plan period, it was, therefore, proposed to take up construction of permanent buildings and complete them during the 7th Five Year Plan itself.

The then existing courses were comprehensive courses designed to make the technician competent enough and to be in a position to take up and job in the related industry. The syllabi, curricula and course content are reviewed periodically so as to update them to be abreast with the latest trends in the fields of Engineering Science and Technology

The job opportunities for the diploma holders are provided through paid employment and self employment. The statistics on un-employment reveal that there is more reliance on paid employment capabilities; self-employment requires

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investment, managerial capabilities, self-confidence and marketing of products, etc. The number of un-employed diploma holders on the live rolls of Employment Exchanges is generally high due to lack of intimation of employment secures: continued interest, of the under employed individuals for better employment; interest of private employed to secure public employment, etc. Hence, the real employed diploma holders can be taken as about 20% of the number of live rolls. This aspect is kept in view while taking up expansion of facilities in existing disciplines.

In order to meet the additional needs of the industry for technical manpower in specialized areas, it was proposed to start diversified and new courses in polytechnics either as whole-time courses or sandwich courses. Some of the identified courses for being started in polytechnics are as follows:-

1. Paper and pulp Technology
2. Plastic Technology
3. Television Technology
4. Industrial Electronics
5. Bio Medical Electronics
6. Electronic Instrumentation
7. Microwave Engineering
8. Computer Technology
9. Computer programming
10. Industrial instrumentation
11. Production Engineering
12. Industrial Engineering
13. Library Science
14. Dairy Engineering
15. Town planning and Architecture
16. Agricultural Engineering
17. Medical Laboratory Equipment Technology
18. Tool Design.

It is also proposed to start post/diploma courses like

1. Refrigeration and Air-Conditioning,
2. T.V. Technicians
3. Navel Architecture
4. Hydrological Engineering
5. Cement and Concrete Technology  
6. Foundry Technology  
7. Welding Technology  
8. Ground Water Engineering  
9. Petro Chemical Technology  
10. Environmental Engineering  
11. Mine Surveying,  
12. Prothetise Orthotics (orthopedic equipment)  
13. Tool Design  
14. Agricultural Farm Equipment Technology  
15. Architecture and Interior Decorator.  

(d) The professional education of technicians in the institutions is at present broad-based, whereas his role in the industry was with reference to the manufacturing process involved. In order to make him specially skilled in particular field, it is necessary to start some advanced technical courses (post/diploma level). Keeping in view the need for such advanced technician courses, it was proposed to set up Statewide institutions of advanced technician courses.  

(e) With the increase in the number of institutions imparting technical education in the State and in view of the expansion of Technical Education facilities contemplated during the VII Five-Year plan, it was necessary to strengthen the administration at State level by creating additional executive and supporting staff, to monitor the schemes, to ensure periodical inspection, evaluation and assessment of the performances of the institutions, periodical internal audit manpower planning and other important administrative activity.  

(f) Provision was made for payment of grant-in-aid to the universities, private engineering colleges and private polytechnics for implementation of the schemes of Technical Education during the VII Five-Year plan.  

(g) A Central Education Film Library was proposed to be set up at Hyderabad for the Department of Technical Education to procure and distribute useful films relating to Engineering Science and Technology as audio-visual education is as important as the conventional instructional method adopted in the institutions. Almost all the institutions have attached hostels. In order to reduce strain on the parents in maintaining the boys in the hostels and in order
to meet the demands of the students for reduction in overhead charges, necessary staff for hostels for their maintenance was created.

Libraries provide a means of self-advancement through self-study. They are also an effective instrument in spreading non-formal education. It was proposed to make adequate provision in the Seventh plan. In this context, emphasis will be on introduction of new technologies (photo copier, V.C.R. etc.) and linking with centers of adult education.

In the field of Technical Education, a little over half of the investments was proposed for polytechnics with a view to emphasizing the intermediate engineer’s skills, establishment of women’s polytechnics in selected Centers as part of the programme of emphasizing upliftment of women is an important element in this field.

(h) In order to ensure campus discipline and development of the institutions it was proposed to construct staff quarters for principals, Hostel Managers and the senior faculty members within the polytechnic campus. As a pilot project, it was proposed to take up construction of staff quarters in selected major polytechnics in the state\(^1\).

**National Policy on Education 1986 : Indian Scenario**

The National Policy on Education (NPE) 1986 amended in 1992 lamented on the poor equipments of education in our country, lambasted the defect of the existing system and charged the system pointing out that ‘little consideration was given to the employability of university graduates and or the absorptive capacity of the job market.’ The apex body in charge of the higher education in India, the University Grants Commission (UGC) took note of the emerging demands for ‘a whole range of new skills. From the graduates of humanities, social sciences, natural sciences and commerce, as well as from the various professional disciplines’. At the whipping of the NPE and acting on the understanding of realities, the UGC established a Curriculum Development Cells (CDC) for 27 subjects, mandating them for ‘modernizing the courses and restructuring them into unit courses and to develop alternate models with emphasis on learning.’ The UGC also identified 35 vocational

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subjects with an ‘emphasis on providing knowledge and skills required for entry into
gainful employment, particularly self employment.’ But, these are not enough.

It was also the time when NPE highlighted the need for reorganizing the
technical and management education system to effectively deal with the management
processes and rapid expansion of knowledge and advances science and technology.
The NPE clearly states that technical education and research should be closely related
to industry. Practical training should form an integral part of technical education and
there should be continuing review of the technical manpower needs of the country.

Such close coordination between technical education and industry was
unknown during the pre-independence period.

Close cooperation between technical education and industry has been further
strengthened in recent years due to certain innovations which have been introduced in
the system of technical education in the country.

**Sandwich Courses**

One such innovation was the introduction of “Sandwich Courses” (also called
“Co-operative Courses) under which a student spends specified periods alternately in
an educational institution and in industry. Each period of study in the institution is
matched closely with the corresponding period of industrial work so that the entire
course becomes a coherent whole of theory and practice\(^1\).

The system of sandwich courses is applicable to the training of various types
of students e.g. degree course engineering students, diploma course technicians,
craftsman etc. However, the pattern of sandwich course is changed according to the
nature of training and the role which the student is likely to play in industry or in the
socio-economic setup of the country on completion of education.

NPE also highlighted and laid the specific guidelines for the qualitative and
quantitative development of technical and management education sectors,
establishment of linkages amongst the concerned agencies, manpower assessment and
technical education forecast increasing effectiveness of technical education
management system, proper delivery systems, measures to achieve greater cost
effectiveness and generation of resources through suitable means. It also turned the

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\(^1\) Chandrakant, L.S. (1971) *Innovations in technical education – Sandwich courses.* Government of India,
UGC’s efforts on autonomous colleges, redesigning courses, State Councils of Higher Education, Accreditation and Assessment Councils, etc. With it, came the creation of self-financing capitation fee based colleges that started to supplement the State and Central Government Engineering Institutes and Colleges. This trend has continued till date.\(^1\)

This policy also gave impetus for the involvement of private and voluntary organizations or agencies in setting up such colleges. It lead to the extra ordinary growth of technical education system at that point of time and continued further.

**Ninth Five Year Plan (1997-2002)**

The Ninth Plan period saw a phenomenal increase in the number of institutions in the technical education sector in the country with the AICTE; granting approval for the setting up of 1,715 institutions across the country mainly through private initiatives. These covered courses/programmes in engineering, technology, management, architecture, town planning, pharmacy, applied arts and crafts, etc. There had also been a corresponding increase in the enrolment of students to meet the growing demand for quality technical/managerial manpower, especially in the field of information technology (IT) and IT-related fields. Networking facilities had also been upgraded.

There is greater use of technology in the teaching-learning process in the IITs in transforming pedagogy, etc. The community polytechnics scheme started in 1978-79 made substantial contribution towards transfer of advance technologies at low cost to the rural population.

A large number of Central, State and accredited technical institutions in the private sector had benefited under the schemes of Modernisation and Removal of Obsolescence, Research and Development, initiated in the Seventh Plan and Thrust Areas in Technical Education, started in the Ninth Plan.

Technical Education had been strengthened and the quality of students passing out of Polytechnics had improved through the World Bank-Assisted State Sector Project which covered 279 polytechnics in nine states in the first phase and 249 polytechnics in ten states in the second phase. The Technical Education Project III

effectively began from January 2nd and was aimed at assisting polytechnics in 2001 and backward areas of the North East, Jammu and Kashmir and the Andaman and Nicobar Islands.

**The Thrust Areas During 9th Plan Were As Under**

- Creating information on IT manpower
- Promoting initiatives in HRD in IT with focus on bridging the digital divide, innovation in Pedagogy, etc.
- Monitoring the intake and out-turn of IT professionals by institutes with the objective to double intake by 2001-02 and triple it by 2003.
- Setting up of exclusive IT institutes improving their quality, infrastructure and promoting networking.
- Launching an IT faculty development initiative.
- Evolving curriculum and courseware of IT institutes.
- Promoting technology-mediated IT education using a web-based and multimedia approach.
- Improving connectivity.
- Promoting postgraduate education and research.
- Facilitating interface with the IT industry.
- Sharing investments between the Central/State governments and industry\(^1\).

**Tenth Plan Performance (2002-2007)**

The Tenth plan period saw a big increase in the number of technical and management institutions, mainly due to private initiatives. During the Tenth Plan, the number of AICTE approved Degree Engineering/ Technology institutions rose from 1057 to 1522 and the annual intake from 2.96 lakh to 5.83 lakh. By the end of Tenth Plan, the aggregate number of technical institutions were 4512 and the intake capacity was 7.83 lakh.

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\(^1\) [http://planningcommission.nic.in/plans/planrel/fiveyr9th/vol2/v2c3-3.htm](http://planningcommission.nic.in/plans/planrel/fiveyr9th/vol2/v2c3-3.htm) (Accessed on 10-03-2010)
During the Tenth Plan, the University of Roorkee was upgraded to an IIT and the number of IITs increased to seven. Seventeen Regional Engineering Colleges (RECs), two Indian Institutes of Science Education and Research (IISERs) at Pune and Kolkata were also set up and three other institutions were upgraded to NIT level. A new Indian Institute of Information Technology, Manufacturing and Design was established at Jabalpur making it the third institute in the series. All the four Technical Teacher Training Institutes were upgraded as NITTTR. Several engineering colleges were conferred with Deemed to-be University status. Many private universities became operational imparting technical education through legislation of various State Government. Bengal Engineering College, a deemed university, was conferred with the status of unitary university and redesignated as Bengal University of Science and Technology. In several States, technical institutions were brought under the purview of new Technical Universities and this improved quality and standards.

The AICTE and Indian Digital Library in Engineering Science & Technology have joined hands to form a combined AICTE-INDEST Consortium. The AICTE has setup 106 virtual classrooms in identified technical institutions under Education Satellite (EDUSAT) scheme to share the knowledge of premier and well established institutions with other institutions.

To enhance learning effectiveness and to expand access to high-quality digital video-based courses, a National Programme on Technology Enhanced Learning (NPTel) has been launched. The TEQIP aims at up scaling and supporting ongoing efforts of the GoI to improve quality of technical education. Under the scheme, 40 lead institutions (including 18 Centrally funded NITs) and 88 State engineering/network institutions (including 20 polytechnics) in 13 States have participated. The programme targets 10000 graduating students each year. It also imparts superior skills and training to enhance the professional development of 1000 teachers. TEQIP phase II is still under negotiation and it is expected to be substantially enlarged, diversified, made more flexible and allow for greater involvement of States in design and implementation.

The Tenth Plan outlay for the technical education sub-sector was Rs. 4700 crore, against which an expenditure of only Rs. 3416 crore was incurred (73%)\(^1\).

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The key issues in technical education during the Tenth Plan had continuing focus on increasing intake; quality of education, including research in technology. Other issues include faculty development; optimal utilization of resources through networking; development of information technology education; modernization of the curriculum; international bench making; developing capacity in new and emerging technology system and developing the informal sector.

During this plan, the thrust on knowledge-based industries call for strengthening the existing infrastructure, modernization of laboratories, workshops, libraries, computer facilities and research and development.

Industry-oriented and practical programmes were offered in selected polytechnics, developed into centres of excellence, i.e., Indian polytechnics Institutes (IPIs) to meet the specialized demand for middle level supervisory technical personnel of manufacturing industries. In addition to giving an opportunity for diploma holders to obtain higher qualifications, this programme also provided the much-needed multi-skilled manpower to industry. Such polytechnics, besides playing a leading role in strengthening the diploma-level education, are also acting as model institutions.

The report of the R.A. Mashelkar Committee, the RECs which give great potential, had been expanded/modernized/upgraded into National Institutes of Technology and conferred the status of deemed to be universities with greater academic and administrative autonomy.

Appropriate schemes have been formulated and implemented in the Tenth Plan to enhance the productivity of the informal sector, improve the skills of workers and facilitate the adaptation of better technologies. The Community Polytechnic scheme had been restructured/expanded by including all the AICTE-approved institutions under its ambit by the end of the Tenth Plan.

Emphasis was given to components relating to transfer of technology, manpower development and technical and support services implementing the schemes.

The IITs and the IISc continued their work in the Technology Development Missions in various areas and providing strong support to Industry-Institute-linkages.

The recommendation of the Rama Rao Committee on enhancing the quality of postgraduate education and research capability through doctoral and fellowship programmes have been implemented in the Tenth Plan. The Committee recommended
the enhancement of the scholarship/fellowship rates to encourage postgraduate education, and better networking among institutions.

The Tenth Plan had been taken up several initiatives for strategic planning and management of technical education. These include an Electronic Management Information System (EMIS) scheme which is supported by AICTE. The National Technical Manpower Information System (NTMIS) facilitates planning and development of technical education in the country.

**Technical Education: Goals and Targets**

**During the Eleventh Plan (2007-2012)**, intake of technical education institutions needs to grow at an estimated 15% annually, to meet the skilled manpower needs of our growth economy.

**Schemes for Expansion and Upgradation**

The Eleventh Plan envisages setting up of 8 new IITs, 6 new IIMs, 10 new NITs, 3 IISERs, 20 IITs and 2 new SPAs. In establishing these institutions, the scope for Public Private Partnership (PPPs) will be explored. Seven selected technical institutions will be upgraded subject to their signing MoU on commitments to making reforms in governance structure, admission procedure, etc. and aligning with character of the national institutions. In the location and selection of sites for the new institutions, clustering will be a key consideration and the States will be incentivized for co-locating institutions in strategic locations.

**Expansion of Intake Capacity in The Existing Central Institutions**

The recent recommendations of the Over Sight Committee (OSC) to increase the intake capacities of the Centrally funded technical institutions in the categories of IITs, NITs, NITTTs, and IIMs provide for an opportunity for major capacity expansion of high level technical and management institutions while providing for social equity.

Considering the urgency in expanding the intake capacity due to the acceleration in demand for technical education, a quick feasibility study will be undertaken to decide upon the optimum intake capacity of the Central institutions and
support them for additional infrastructure, etc.. In view of the increasing demand particularly for MBAs, Departments/ institutes of Management and Business Administration in the university system will also be strengthened.

**Strengthening State Technical Institutions**

The State Engineering Colleges suffer from severe deficiencies in academic infrastructure, equipment, faculty, library facilities, and other physical facilities. Top ranking students in entrance examination of the states opt for these institutions in view of relatively low fee structure and government recognition. These are supposed to be model institutions for the private sector institutions to benchmark their standards. If standards and norms are insisted upon for private institutions, the government cannot keep its institutions in unsatisfactory condition.

Technical Education Quality Improvement Programmes (TEQIP) phase II is expected to be substantially enlarged to cover additional 200 State engineering institutions, diversified, made more flexible and allow for greater involvement of States in design and implementation. There will be one-time assistance for project-based support and funds will released on performance and the State Government accepting a minimum set of reforms including curriculum revision, etc. Proper appraisal system of the projects and effective Monitoring and Evaluation (ME) system will be established. TEQIP-II projects will be on log frame.

Efforts will be made to establish 50 centres for training and research in frontier areas like Biotechnology, Bio-Informatics, Nano-Materials and Nano-Technologies, Mechantronics, MEMS, High Performance Computing, Engineering, etc. However, these will be funded on the basis of specific proposals and on a competitive basis.

**Eleventh Plan Proposals**

New polytechnics will be setup in every districts not having one already on priority basis. These polytechnics will be established primarily with Central funding and over 700 will be setup through PPP and private funding. All these new polytechnics institutes will have a Community Polytechnic (CP) Wing. Women’s hostel will also be setup in all the government polytechnics. The existing government
polytechnics will be incentivised to modernize in PPP mode. Efforts will also be made to increase intake capacity by using space, faculty, and other facilities in the existing polytechnics in shifts.

There is a shortage of qualified diploma holder in several new areas. Therefore, engineering institutions will be incentivised and encouraged to introduce diploma courses to augment intake capacity. Diploma programme could be run in evening shifts when the laboratory, workshop, equipment, and library are free. The faculty could be incentivized for institutions running diploma programmes in an optimal manner. This will also restore the credibility of diploma programmes and also support vertical mobility for higher education.

In fact, Sant Longowal Institute of Engg. & Technology (SLIET) and North Eastern Regional Institute of Science & Technology (NERIST), Itanagar already have vertically integrated certificate, diploma and degree programmes.

Teachers in the polytechnics will be trained continuously to upgrade their teaching knowledge and skill to keep pace with the industry. The curriculum of diploma courses will be revised. Polytechnics will be encouraged to involve industrial and professional bodies in developing linkages with industries in their vicinity (Surrounding Areas).

Setting up of additional 210 community colleges, mainly in Northern, Western and Eastern parts of the country will be supported on placement based funding. Existing 190 community colleges (largely in Southern States, some of which offer diploma courses) will also be supported for capacity building, training cost (equipment faculty development, Transaction Lifecycle Management (T.L.M), stipend, etc. but not for civil works and other capital costs).

All India Council For Technical Education (AICTE) : Apex Advisory Body Of Technical Education In India

The beginning of formal technical education in India dated back to the mid 19th century. The major policy initiatives in the pre independence period included appointment of the Indian University Commission in 1902, issue of the Indian Education Policy Resolution in 1904 and the Governor General’s Policy Statement of

1913 stressing the importance of technical education, the establishment of IISc in
Banglore, Institute for Sugar, Textile and Leather Technology in Kanpur, National
Council for Education (N.C.E.) in Bengal in 1905 and Industrial schools in several
provinces. Significant development included:

- Constitution of the Technical Education Committee of the Central
  Advisory Board of Education (CABE) of 1943.
- Preparation of the Sergeant Report of 1944; and
- Formation of the All India Council for Technical Education (AICTE) in
  1945 by the Government of India (GOI)1.

In our country, the technical education system is a complex one. It governed
by the Central Government through MHRD and its bodies like AICTE, UGC etc. The
importance of the education sector, particularly a professional discipline like
engineering studies, is increasing day by day in our country2.

Higher education in India is coordinated by several agencies. While the
university system falls within the jurisdiction of UGC, different bodies coordinate
professional institutions. The All India Council for Technical education (AICTE) is
responsible for coordination of technical and management education institutions3.

All India Council for Technical education (AICTE) was set-up in November
1945 as an apex body at the national level supported by its Regional Committees,
Boards of Studies, has been entrusted with the responsibility of coordinated
development of technical education and maintenance of prescribed standards. The
role played by the council during all these years has been significant, but for some
time past, the council has not been as effective in fulfilling its role as it should have
been because of number of factors, including unregulated expansion of technical
education in some cases without reference to the overall needs of the economy4. And
to ensure the same, as stipulated in the National Policy of Education (1986), AICTE)
was vested with statutory authority for planning, formulating and maintain the norms
and standards, quality assurance through accreditation, funding the priority areas,
monitoring and evaluation, maintain parity of certification and awards and ensuring

1 Digital Library and E-Journals initiatives for technical universities and institutions in India (2008). In Recent
44(43) Oct. 23-29. pp.13-16
in institution of higher learning. University News. 44(35), August 28-September 03.p.2.
4 Programme of Action: National Policy on Education. (1986). New Delhi: Govt. of India, Ministry of Human
Resource Development: (Deptt. of Education)
coordinated and integrated development and management of technical education in the country. It was established by the Ministry of Human Resource Development (MHRD), under the G.O.I.

The Government of India (MHRD) also constituted a National Working Group to look into the role of AICTE in the context of proliferation of technical institutions, maintenance of standards and other related matters. The group recommended that AICTE be vested with the necessary statutory authority for making it more effective and strengthening with necessary infrastructure and operating mechanisms under the GOI, it has categorized the following subject areas as technical education:

- Engineering
- Technology
- Management
- Architecture
- Pharmacy
- Medicine etc.

The Technical Education System (TES) in India covers courses at under-graduate, post-graduate and research level in these subjects. The under mentioned institutions import high quality technical education at all the three levels.

1. Indian Institute of Technology (7)
   @ Chennai, Delhi, Mumbai, kolkata, Kanpur, Kharegapur and Guwahati.

2. Indian Institute of Management (6)
   @ Ahmedabad, Bangalore, Kolkata, Lucknow, Indore and Kozhikode.

3. Indian Institute of Science, Bangalore.


5. Indian Institute of Information Technology, Allahabad.


7. National Institute of Technology (20)
   @ Agartala, Allahabad, Bhopal, Calicut, Durgapur, Hamirpur, Hazarathbad, jaipur, Jalandhar, Jameshedpur, Kurukshetra, Nagpur, Patna, Raipur, Rourkela, Silchar, Surat, Surathkal, Trichy and Warangal.
AICTE Act Of 1987

Pursuant to the recommendations of the National Working Group, the AICTE bill was introduced in both the houses of Parliament and passed as the AICTE Act No. 52 of 1987. The act came into force w.e.f. March 28, 1988. The statutory All India Council for Technical Education was established on May 12, 1988 with a view to proper planning and coordinated development of technical education system through the country, promotion of qualitative improvement growth, and regular and proper maintenance of norms and standards in the technical education system and for matters connected therewith.

AICTE is vested with statutory authority for planning, formulation and maintenance of norms and standards, quality assurance through school accreditation, funding in priority areas, monitoring and evaluation, maintaining parity of certification and awards and ensuring coordinated and integrated development and management of technical education in the country as part of the AICTE Act No. 52 of 1987.

The AICTE Act Stated Verbatim Reads

(To provide for establishment of an All India Council for Technical Education with a view to the proper planning and co-ordinated development of the technical education system throughout the country, the promotion of qualitative improvement of such education in relation to planned quantitative growth and the regulation and proper maintenance of norms and standards in the technical education system and for matters connected herewith.)

Current Objectives

In order to improve upon the present technical education system, the current objectives is to modify the engineering curriculum as follows:

1. Greater emphasis on design oriented teaching, teaching design methodologies, problem solving approach.

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2. Greater exposure to industrial and manufacturing processes.
3. Exclusion of outmoded technologies and inclusion of the new appropriate and emerging technologies.
4. Greater input of management education and professional communication skills.

**The Organization Of AICTE**

In accordance with the provisions of AICTE Act (1987), for the first five years after the inception in 1988, the Ministry of Human Resource Development, Government of India, was the Chairman of the Council. The first full time Chairman was appointed on July 2, 1993 and the Council was reconstituted in March 1994 with a term of three years. The executive committee was reconstituted on July 7, 1994 and All India Boards of Studies and Advisory Boards were constituted in 1994-95. Regional office of the Ministry of Human Resource Development, Government of India, located at Kolkata, Chennai, Kanpur and Mumbai were transferred to AICTE and the staff working at these offices were also deputed to the council on foreign services terms w.e.f October 1, 1995. These offices functioned as secretariats of Regional Committees in the four regions (East, South, North and West). Three new regions with their secretariats located at Banglore, Bhopal and Chandigarh respectively were also established on July 27, 1994.

The AICTE has its headquarters in New Delhi, which has the offices of the Chairman, Vice-Chairman and Member Secretary and is presently housed in building having a covered area of 38542 sq. ft. located in the Indira Gandhi Sports Complex, Indraprastha Estate, New Delhi. The present building is taken on lease from the Sports Authority of India. The Government of India has allotted 5 acres land in the campus of Jawaharlal Nehru University, New Delhi, for constructing the administrative and other buildings of the council.

The AICTE comprises of nine Bureaus, namely:
- Faculty Development (FD) Bureau.
- Under Graduate Education (UG) Bureau.
- Postgraduate education Research (PGER) Bureau.
- Quality Assurance (QA) Bureau.
- Planning and Co-ordination (PC) Bureau.
- Research and Institutional Development (RID) Bureau.
- Administration (Admin) Bureau
- Finance (Fin) Bureau.
For each bureau, Advisor is the Bureau Head who is assisted by technical officers and other supporting staff. The multi disciplined technical officers and staff of the Council are on deputation or on contract from various Government Departments, UGC & Academic Institutions etc.

The All India Council for Technical Education has set up eight boards of Technical Studies in different branches of engineering, technology, management etc., to advise the Council on such matters as the preparation of models courses of studies and the specification and regulation of standards in the respective subject fields.

Technical Education is normally administered by the Education Departments of State Governments. In some cases however, it is being administered by other departments such as Department of Industries or Public Works Department (PWD) etc. On the recommendation of the All India Council for Technical Education, most of the State Governments have also established separate Directorates for the effective administration of technical education.

The activities of the polytechnics in each State are coordinated through the concerned State Board of Technical Education within the overall national policies formulated by the All India Council for Technical Education. The Directorate of Technical Education is responsible for the administration and inspection of the polytechnics and provides secretariat assistance to the State Board of Technical Education which conducts the examinations and awards the diplomas.

Three patterns of courses have so far been evolved for technical education: 1) three-year full time, 2) two-year full-time courses, and 3) sandwich courses. About 94% of the polytechnics (excluding the girls polytechnics) offer the three-year full-time diploma courses.

References:
AICTE Changed Accreditation Rules And Procedure

The All India Council for Technical Education has changed its accreditation norms and procedure from January 1, 2009 to make them compatible with international standards.

The revised norms and procedures have been applied since January 1, 2009.

The changes have been necessitated by the Washington Accord which requires its signatory countries to follow uniform international benchmarks in technical education at undergraduate level. India, a provisional member of the Accord aspired to become a full-fledged member and hence needed to change its accreditation norms and procedures to make them compatible with global standard.

According to the revised norms and procedures introduced by the National Board of Accreditation (NBA) of the AICTE, the NBA inspection team check the overall placement success of the institute and satisfaction and comfort level of students.

They take into consideration the enrolment status, admission norms for the students and if the institute is able to fill up all the programmes which it runs.

Facilities for career guidance and arrangement to assist students suffering from psychological disorders are also now part of the accreditation procedure.

The team visits the training placement facilities of the institute and confirms that there is a full time officer or a faculty who devotes adequate time for overseeing this facility.

Up to now, the NBA used to take into account among other things, the faculty, physical infrastructure, number of computers and books available in the institute providing technical education. A three-day visit to an institute by a NBA team of experts in relevant fields used to assess the applicant institute on a 1,000-point scale. For a three year accreditation, the score was to be 650 or more and for a five year one, the minimum score expected was 750.

As against this, the Washington Accord countries insisted on qualitative parameters focusing on the actual performance of the students in industries and research organizations.

The Washington Accord is an International Accreditation Agreement for professional engineering degrees, between the bodies responsible for accreditation in its signatory countries, established in 1989.
Signatory countries are Australia, Canada, the Republic of Ireland, Hong Kong, Japan, New Zealand, Singapore, South Africa, South Korea, Taiwan, the United Kingdom and the United States.

Germany, India, Malaysia, Russia and Sri Lanka were inducted as provisional members of the Accord in 2007 and they have to live up to the international standards to qualify for full-status membership of the Accord. The Indian institutes are considered at par with those from the developed nations and Indian students would not have to sit for a separate examination or enroll for training courses for getting jobs or practicing licenses in those countries.¹

Council for Scientific and Industrial Research (CSIR)

The Council for Scientific and Industrial Research (CSIR) was established in 1942, is mainly concerned with Industrial/Applied Research and the Council has been appropriately placed with the Department of Science and Technology. The CSIR laboratories and Industrial Research Associations have been classified into six groups as Chemical Sciences, Physical and Earth Sciences, Engineering Sciences, Biological Sciences, Fibres and Scientific Information, with a coordination Council for each of them with a view to achieving optimum Inter-laboratory collaboration. Many of the administrative powers concerning the laboratories have been delegated to the Directors of the laboratories.

“The Research Programmes of the laboratories are formulated to ensure a coordinated, integrated, inter-disciplinary, inter-laboratory and inter-laboratory approach, keeping in view at the same time the objectives of the laboratories.”

The Council also “undertakes long-range research projects of national importance, such as Coal resources survey and development, search for new antibiotics, chemistry of plant products, reproductive physiology and development of economic and effective methods of treatment of water, sewage and industrial wastage effluents, etc. and continue to receive the attention of the laboratories.”²

To encourage research activities in the country, the Council offers financial aids for research in the University Departments and research institutions by supporting research schemes. The Council awards fellowships and under the

“Scientific Pool Scheme” (SPS), the Council also appoints scientists in various Institutions. Apart from its News Letter, the Council also publishes the Technical Manpower Bulletin.

Under its Engineering Science Group alone, there are about 13 research institutions out of 41 research institutions that spread over the country\(^1\).

**Indian Society For Technical Education (ISTE)**

The Indian Society for Technical Education (ISTE) was established in 1966 for the development of Technical Education in the country. It has been created to control, regulate and insist on Standards for Technical Education though the society at present is not really able to exercise full control and perform to the intended functions\(^2\).

The ISTE formulated a detailed status paper on technical education during its Annual Convention on “Technical Education in India-Promise and Performance”, in 1992, which covers such aspects as the performance of Technical Universities, Role of Directorates of Technical Education, Industry links and Technical Education for social meta-morphosis. The proceedings also serve as a guide for government in formulating the necessary programmes of development\(^3\).

The ISTE is the only national organization of educators in the field of engineering and technology, registered under the Societies Registration Act of 1860. The major activities of ISTE are as follows:

- To adjust curriculum and educational to changing conditions.
- To bring about effective linkage between technical institutions, industries and society.
- Summer/Winter schools for engineering teachers and practicing engineers and thus providing a common platform to the engineers from institutes and industries.
- Seminars/Workshops/Conferences on latest topics of relevance to technical education.
- Special short term industrial exposure programmes for teachers organised by industries in their premises.

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In brief, the major objective of the ISTE is to assist and contribute in the production and development of top quality professional engineers and technicians needed by the industries.\textsuperscript{1}

\textsuperscript{1} ISTE Handbook. ISTE, 2003-04.pp.6-7