CHAPTER – V

POLICY PERSPECTIVE IN ENGINEERING EDUCATION

5.1 BACKDROP

Engineering education like other types of professional education in India has not had a long history. Though the ancient and medieval Indian artisans had built large brick and stone houses, castles, cities and temples which show considerable knowledge of what are now termed as civil and hydraulic engineering, yet in other branches of engineering, India had no substantial tradition.

While going into the history of technical and engineering education in India we find that in ancient India some education of this type was given to the young mostly through their parents. There were certain castes that were engaged in manufacturing goods. They trained their progeny in their caste profession. Thus the technical education was propagated from generation to generation. There was not much scope of the development of formal system of technical education in this way.

In the medieval period when Muslim rulers established their rule over the different parts of the country, the Islamic government in certain provinces paid more attention towards training the natives in technical skills according to their needs and requirements. New techniques of production of armoury, clothes, pottery, agricultural tools, etc. and construction of buildings, roads and bridges were
developed during this period under their patronage. Even the private houses also arranged to provide technical education to people. Thus in medieval period some technical schools came into existence but the scope of education imparted by these institutions was very narrow and it pertained only to the development of handicrafts or cottage industry.

5.2 ENGINEERING EDUCATION IN PRE-INDEPENDENCE PERIOD

Before independence, India was a very backward country. Its industry was mostly cottage based. The Britishers did develop some modern industry in India but only with a view to fulfill the interests of British imperialism. This industry was mainly concerned with extraction of minerals, transport system and agriculture. The industrial policy of the British government was based on the interests of British Capitalist Class. India was treated as a market for exporting raw materials (both agricultural and mineral) to England and importing many manufactured goods from England to India. In this way, the Britishers exploited the Indian economy.

As far as education was concerned only seven percent of the population was literate when India became free. This rate of literacy was quite hopeless in itself. If we take engineering education into consideration this figure becomes all the more dismal.

East India Company felt the need for some workers and technicians for their own interests. It leads to the establishment of Roorkee Institution in 1847. The first government college of
engineering was established in 1854 in Poona, the second ‘Bengal Engineering College’ in Howrah (1856) and the third ‘Guindy Engineering College’ in Madras (1862). The Pune Engineering College was setup in 1886. Besides these colleges another Institute ‘Victoria Jubilee Technical Institute’ was established in 1887 in Bombay with Electrical, Mechanical and Textile engineering and technology trades.

In 20th century too some attention was paid to the engineering education by the Britishers. In 1904 the ‘Association for Advancement of Scientific and Industrial Education’ was established to encourage the engineering education in the country. In the year 1908 an engineering college was set up at Jadavpur (Bengal). In 1915, the ‘Indian Institute of Science’ at Bangalore was established. In 1917, the first degree classes in Mechanical Engineering and Electrical Engineering were started at Banaras Hindu University. In 1921 a special committee under the chairmanship of Lord Lytton was entrusted to work specially in the field of technical education. After this, some institutions like Harcourt Butler Technological Institute, Kanpur, College of Engineering & Technology, Jadavpur, Government School of Technology, Madras were established. Some educationist and Committees like Pranjape, Sapru Committee (1934), Abbott Wood Committee (1936-37) recommended that technical and engineering education should be given more priority. In 1936-37, Delhi Polytechnic was started which was later known as Delhi College of Engineering. The most important decision was taken
by the government when in 1945, ‘Department of Scientific and Industrial Research’ and ‘All India Council for Technical Education’ were established by the government of India to supervise all technical institutions above the high school stage.

Nalini Ranjan Sarkar Committee submitted its report in 1946. It recommended that the establishment of proposed five IIT institutions should attain a standard not less than the Manchester and Massachusetts institutes of technology. The committee had also recommended that “the future of Indian industrial and agricultural development must depend upon the supply of first class technical brains, trained in an atmosphere both of original research and of practical experience”. It should be noted here that no action was taken regarding the recommendations of this committee before independence.

A cursory glance at the development of engineering education before Independence shows that it was limited, undiversified and established mostly in the southern states. It did not satisfy the requirements of Indian nation and it was very poor in quality. Most of the technical work was done by the semi skilled Indian artisans. Such a situation did not encourage any type of development in Indian Engineering Education. Therefore, we can easily conclude that due to the imperialist interests of the British government in India, sufficient attention was not paid to engineering education. As far as Punjab is concerned it was totally neglected.
5.3 ENGINEERING EDUCATION AFTER INDEPENDENCE

On the eve of Indian Independence, India was one of the most backward countries of the world. It was predominantly an agricultural country and agriculture was mostly dependent upon nature. There was hardly any heavy industry throughout the country. Only cottage and small scale industry existed to cater the needs of local people. Though some technical and engineering institutions were opened by the British Government here and there but they were of low standard having no innovative facilities for research work etc. Pandit Jawahar Lal Nehru, the first prime minister of India stressed that Indian Government had to provide engineering education of high standard in various fields, if it wanted to develop the industrial base of the country. He was a visionary who had a passionate desire for developing free India on secular, democratic and modern lines. According to him it was possible only if India developed its industries in which modern technology could be used. He also realized that if all the industries have to be run properly there was a need of a large number of well trained engineers. As the private industrial sector was not able to lay down the required infrastructure so the government came forward and spared funds from the state exchequer for installing adequate infrastructure.

In order to provide engineering education, a number of institutions were opened and trained engineers were prepared in a
large quantity to meet the requirements of the new industry. These engineers were to design, produce, manage and maintain the newly setup industries. Moreover with the help of research and development in engineering by going through research in engineering they were able to utilize available resources efficiently in order to satisfy the needs of the economy with limited resources at their disposal.

But despite the fact that India was predominantly an agricultural country, little had been done towards the development of the agricultural engineering. India had a lot of working hands and traditional artisan castes. Both these factors must have been considered when the question of the development of Indian engineering education was raised. Having more working hands in India did not require enough automatic industrial plants. But the technical and engineering education was not imparted to the masses at large. Artisan castes were also not kept in mind while planning about expansion of engineering education. These castes could have served well with even a little knowledge and training.

As far as the development of engineering education in Punjab is concerned no attention was paid by the British government. It was after Independence of India that Punjab Engineering College, Chandigarh was established in 1953. Before independence it was called the Maclagan Engineering College and was located in Lahore. After independence it was moved to Rourkee and the other two
institutions were established in 1956 at Patiala and Ludhiana named ‘Thapar Institute of Engineering & Technology’ and ‘Guru Nanak Dev College of Engineering & Technology’ respectively. In 1962, an advancement was made in the field of technical education with the establishment of Punjab Agriculture University, Ludhiana. The Punjabi university at Patiala came into existence in the year 1962 for the promotion of Punjabi language. In 1987 the university opened the Department of Computer Science & Engineering. GNDU Amritsar was established in 1969. From 1972 to 1996 various departments were established in the university to provide technical course at degree and post graduate levels. In 1987, Dr. B.R. Ambedkar Regional Engineering College was established at Jalandhar with the help of Central Government. Now this institution has been converted into the ‘National Institute of Technology’ in 1989 ‘Sant Longowal Institute of Engineering & Technology’ was established with the help of Ministry of Human Resource Development at village Longowal in the Sangrur district. To meet the needs of students of Southern Malwa belt, Punjab Government also established named Giani Zail Singh College of Engineering and Technology at Bathinda. Now it has become an autonomous. In 1993 and 1995 another institutions were established by Government of Punjab named Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib and Beant College of Engineering & Technology, Gurdaspur. When Punjab Technical
University at Jalandhar has been established in 1997 more institutions were opened up.

5.4 **SALIENT FEATURES OF ENGINEERING EDUCATION THRUST IN FIVE YEAR PLANS**

**First two, Five Year Plans (1951-61)** laid the foundation stone of expansion of technical institutions in the country. A long term planning was done for the development of technical and engineering education in India. On the recommendations of **Sarkar Committee (1945)**, IITs were established to provide the post graduate courses and research oriented works at Kharagpur, Bombay, Madras, Kanpur and Delhi. The **‘Engineering Personnel Committee’ (1955)** recommended the establishment of Regional Engineering Colleges throughout the country. The first ‘Regional Engineering College’ of these was established in ‘Warrangal’ in 1959 to provide adequate facilities for graduation to meet the needs of industry and research work, to develop programmes for faculty development, etc. In this plan financial investment in technical education had also correspondingly increased manifold.

**Third Five Year Plan (1961-66)** laid stress on trained personnel required for schemes of industrial development, teaching & research programme, provision for scholarships & fellowships for talented but poor students, reduction in wastage of superfluous expenditure promotion of curriculum, etc. Provisions were made for
expansion of engineering education facilities at the degree level so as to increase the annual admissions.

In the **Fourth Five Year Plan (1969-1974)**, it was proposed to keep the enrollment targets under review in the light of the assessed demand of engineering personnel in the fifth and subsequent plans. This plan laid stress on improving the quality of engineering education. The improvement program planned to relate the pre-service and in-service training of engineers in industry and training of teachers and the reorganization of diploma courses in order to diversify them functionally to the needs of industry expansion and improvement of post graduate engineering studies and research.

The thrust of **Fifth Five Year Plan (1974-79)** in technical and engineering education was on the promotion of post graduate studies & research work and to establish the linkage between institutions and industry. In other words more emphasis was laid on imparting of practical training to the pupils, checking the mismatch between demand & supply of engineers, developing the faculty through training programme and developing curriculum. A number of programmes under the ‘Quality Improvement Program’ were launched. The ‘20 point economic program’ (Book Banks Scheme) was proposed to be established in engineering colleges. AICTE had recommended that each institution must setup a textbook library to help poor students. It had also been suggested that cooperative stores must be established in all institutions to provide stationery
and exercise books at cheaper rates. It was also suggested that for the welfare of the SC/ST students extra coaching classes would be held and for women teachers special seats would be reserved at M.Tech & Ph.D levels especially in institutions of excellence like IITs and NITs, etc.

In the **Sixth Five Year Plan (1980-85)** major emphasis was on ‘optimum utilization of existing facilities, raising’ the quality of engineering education, furtherance of national efforts to develop and apply science and technology for country’s socio-economic progress. Besides this in pursuance of the recommendations made by the AICTE, the scheme of ‘National Technical Manpower Information System’ would be introduced to provide upto date and meaningful manpower information.

During **Seventh Five Year Plan (1985-90)**, more stress was laid on rapid modernization of the economy envisaged in the near future. For the improvement in productivity, the role of technical education was more essential. In this context, the emphasis was on the consolidation of infrastructure, optimum utilization of the existing facilities with attention to cost effectiveness, improvement of quality & standards, removal of obsolescence, modernization of engineering labs etc. It was planned that to achieve these objectives there would be balanced development of engineering institutions at all levels. The IITs which had been set up as pace setting institutions would be further developed as advanced centres of excellence. An
expert committee had been setup to look into the requirement of these institutions in the context of the challenges ahead.

The thrust areas during **Eighth Five Year Plan (1992-97)** was to check the proliferation of substandard institutions, to modify the outdated curriculum, to check the disparity in the quality of education, research oriented works and strengthening of the management system.

The **Ninth Five Years Plan (1997-02)** reiterated the objective policy directions of the NPE (National Policy of Education) (1986) and POA (Program of Action) (1992) like expansion of institutions especially development of autonomous colleges, stress on trained faculty, research & development works, review & monitoring of the engineering education, etc. This plan also emphasized that the colleges might have freedom to design curricula.

The main objectives of the **Tenth Five Year Plan (2002-07)** were to increase the intake of students in engineering education. It was planned that the strategies focus on increasing access, quality and liberalization of the technical system. Emphasis on relevance of curriculum, vocationalization of work and networking on the use of IT, establishment of more deemed universities, etc. The NTMIS would be strengthened and expanded to check the demand and supply of engineering graduates.

The thrust areas of **Eleventh Five Year Plan (2007-12)** is to review the status of engineering education, to critically examine the
issues of access, quality & relevance, removal of obsolescence and modernization of labs, workshops, libraries, computer facilities, international bench marking & effective transparent accreditation. The plan also stressed to take measures to increase participation of women, underprivileged sections of society and the disabled in the area of engineering education. It was also stressed that it should be examined whether the internal generation of resources and recommendations made by the CABE committee on financing of technical education that the upper limit of cost recovery from the students in the form of fees should not be more than 20%.

5.5 VIEWS OF VARIOUS COMMISSIONS AND COMMITTEES AND DEVELOPMENT OF ENGINEERING EDUCATION

The first Education Commission of Independent India was established under the chairmanship of Dr. Radha Krishnan in the year 1948 to look into the reconstruction of university education for meeting the scientific, technical and other man power requirements for the socio-economic development of the country. The commission noted that “for a fuller realization of the democratic principles of justice and freedom for all, we need growth in science and technology”. The following suggestions and recommendations were given by the commission for enhancing engineering education in order to meet the growing demand of skilled labour by the Indian industries.
“.....The faculties of engineering education be called to improve teachers representing different branches of engineering and technology, a few scientists, teachers of humanities and commerce and a number of practicing engineers and technologists. Moreover the enquiries should be made of the possibilities for training graduate engineers and scientists in America so that Indian institutions may teach the standard, know-how as is required by the American engineers. In order to meet the required number of efficient teachers, some institutions may also be opened for their education. In these institutions facilities for research and practical work may be provided. Wherever possible the existing engineering and technological colleges be upgraded for post graduate training and research in selected subjects. The existing colleges are national assets on which the future of engineering education may be built. Moreover the new engineering colleges should be opened. They should be of different grades so that they should train subordinate staff like foremen, craftsman, draftsman, overseers; mechanics etc. These persons will handle the mechanics practically under the guidance of their senior executives. Moreover all the persons must be given practical training at different factories during vacations or as post graduates works training. Even the in-service training institutes may be opened for teachers, so that they may be able to renew their knowledge off and on”.

Another recommendation by the commission was related to the control and management. The commission was of the opinion
that the government should provide the needed finances and should not interfere into the routine work of the institutions. All the placements, curriculum and assignment of duties may be done by the Principals in collaboration with university administration. In short the commission recommended independence for institutions providing engineering education.

**The Secondary Education Commission (1952)** worked under the chairmanship of Dr. A. Lakshman Swami Mudaliar,. This commission made the following recommendations.

“Technical schools should be started in large number either separately or as part of multi-purpose schools. Central technical institutes should be established in large cities. Where ever possible these should be located in close proximity to appropriate industries. A small cess to be called the Industrial Education Cess should be levied on industries and the proceeds of this cess should be used for the furtherance of engineering education”. This commission supported the recommendations of the previous commission but it suggested a new method of collecting funds for the engineering education.

**Thacker Committee (1959)** recommended that in engineering colleges, quality of the staff must be improved through quality improvement programmes and short term courses. The procedure of the selection of the staff must be merit based. Sponsorship from industry in PG and research is encouraged. Scholarship incentives be awarded for PG and research programmes by the government.
In the field of Indian education ‘Kothari Commission’ (1964-66) has been considered a mile stone because its suggestions were more scientific, more wide spread and more practicable besides taking into consideration the new environment of the country. This new environment was created by the consistent efforts of the government of India for installing the needed infrastructure which required a lot of investments and that was possible only through the state exchequer. At this stage the private sector had also established itself and it could spare capital for the infrastructure needed for still more industries. So an environment had come to existence in which both the government and private sectors could contribute jointly to the development of engineering education in India. The private industries were also able to give employment to the young engineers thus solving the problem of placement to a large extent. Moreover as the private sector depended upon the production of quality goods with low cost and indigenous machines therefore quality of engineering education was also stressed upon. Earlier in Punjab also the government established ‘Punjab Engineering College at Chandigarh in 1953 in which many new branches of engineering were opened and quality education was made the watch -word. Similarly ‘Thapar Institute of Engineering and Technology, Patiala’ (1956) was opened by an industrialist Mr. Thapar. He financed the whole institution and imparted engineering education and technological training in the branches that were much in demand.
This institution also had set the aim of imparting quality education in engineering.

Other recommendations that were made by Kothari Commission were related to the admissions, equity and quality of education. It laid down a definite procedure for admission to the graduate and the post graduate engineering degrees. It recommended that the admissions should be based upon the merit of candidates in the lower classes. An interview might also be held to assess the candidates’ interests, attitude, and sharpness of mind. It also recommended that as far as rural population and underprivileged sections of society were concerned, some seats must be reserved for them. They should also be assisted financially by giving concessions in the charges and through scholarships.

Thus ‘Kothari Commission’ had an overall view for the development of engineering education. Its main thrust was on expansion of technical and engineering institutions; quality of engineering education and equal opportunity for the privileged and underprivileged. Moreover it stressed the need of qualified and efficient staff that was to be recruited from those post graduate engineers who had done their post graduate degree from IITs.

For a long period after ‘Kothari Commission’ no other education commission gave any suggestions for the improvement of engineering education because Kothari Commission’s report was all comprehensive and established relevant guidelines in almost all the
spheres of education including engineering education. The most important question for the government was to implement these recommendations.

**Nayudamma Committee (1979-80)** had recommended that it should be made mandatory to prescribe a Post Graduate degree as a minimum qualification in many positions in industry, organizations of Research & Development etc. The committee stressed that a reliable Manpower Information System for storage, retrieval, updating and analysis of Manpower information should be established to assist technical education planning.

It was only in the **National Policy on Education (1986)** when some remedies were recommended to check the limitations of actually existing system and some meaningful suggestions were made for the growth and development of engineering education throughout India to meet the rising demands of the economy in every sphere. The government was clear about that it alone cannot meet all the financial requirements for raising the standards of engineering education and for its spread throughout the country. Though the central government established six IITs, a number of regional engineering colleges and some deemed universities with the assistance of public funds, yet it also encouraged the private entrepreneurs to open their own institutions according to their own industrial requirements. ‘All India Council for Technical Education (AICTE)’ was given the statutory powers for controlling private
engineering institutions and laying certain conditions to be fulfilled by them regarding admissions, fee structure, faculty, expansion and quality in 1987. Specific rules were made for the upliftment of Scheduled Castes (SC), Scheduled Tribes (ST) and Backward Classes (BC) so that they might get admissions in these institutions. Financial institutions like banks were asked to give educational loans on low interest to the needy students. Thus some students from the under privileged classes and rural areas were able to get admissions in these institutions because seats were reserved for them, scholarships and stipends were offered to them and easy loans were given to them. Though entrance tests were made compulsory for admission but the backward communities were given some concessions in the percentage of marks required to appear in these tests. Even the central government and some states arranged special classes at their own expenditure for their preparation for the competitive examination.

But the July 1989 conference of Central Advisory Board of Education’s report which was presented before the NPE Review Committee (1990-1992) described the scenario of technical education as under:

i. “While a large number of habitations in the country are even today without any facilities for technical education, about 38% of the degree level institutions and 30% of the Diploma level institutions recognized by the All India
Council for Technical Education (AICTE) are concentrated in four states – namely, Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu. Almost all the engineering colleges and polytechnics unrecognized by the AICTE are in these four states; and many of them are sub standard institutions run on commercial basis.

ii. The enrolment of girls in technical education institutions at degree level is only about 12%, while at diploma level it is about 17%.

iii. The enrolment of SC/ST students in degree level institutions is less than 5% and in diploma level institutions less than 9%.

iv. In most of the institutions, both at degree and diploma level, there is hardly any Research and Development activity. R&D activities generally take place in the IITs, IISc (Bangalore) and a few universities and colleges.

v. There is serious unemployment among engineers and technicians. At the same time, there is a shortage of highly trained engineers in engineering design, advanced materials, turbo–machinery, computer science and microelectronics. There is a mismatch between production and demand. With the anticipated industrial growth and economic development by the turn of the century, we may
have to produce many more qualified engineers and technicians than at present.

vi. Wastage in the system is enormous. An analysis of the intake and out turn figures of recognized institutions shows that wastage at degree level is about 30%, at diploma level 35% and at post – graduate level 45%. The situation in unrecognized institutions is worse.

vii. There is acute shortage of faculty. About 25 to 40% of faculty positions remain unfilled.

viii. Even our premier institutions are struggling to keep themselves uptodate. The infrastructural facilities available in the vast majority of our technical education institutions are alarmingly inadequate. The quality of training in most of the institutions is poor. Many of the courses offered in these institutions are outdated. Teaching competency is low, while the management system continues to be rigid. High quality engineers and technologists trained in emerging areas in some of our prestigious institutions migrate abroad. In addition, many good graduate engineers take up management and other professions.

ix. Technical education institutions by and large function in isolation. In spite of all that has been talked about on the matter, linkages and interaction between technical
education institutions and user agencies (such as industry, R and D organizations and development sectors) are not sufficiently strong”.

In spite of the above scenario many measures suggested by NPE assisted the deprived classes. But the situation required much more efforts to be made.

Another flaw in the new policy of education was underlined when in 1990 'Programme of Action' was devised. The authorities came to the conclusion that many intelligent and efficient engineers having post graduate qualifications and research aptitude shift to foreign countries, thereby draining the efficient human resources of the country. Thus, some measures were suggested to check it. Moreover it was also on the agenda that engineers might not be allowed to shift their profession as the case with many shining students who had begun to prefer to go to civil services. In order to keep them in the engineering profession, it was also suggested that they might be offered good terms and conditions of work. Again, many brilliant degree holders did not like to join the education cadre, so it was also under the consideration of educational authorities to inspire them for working in educational institutions.

Moreover it was also pointed out that although many government and private institutions had been paying attention towards research work in different fields of engineering. Yet our national libraries, laboratories and other structural requirements
were not up to the mark. Therefore it was suggested that different institutions should pool their resources to overcome the above impediment.

**P. Rama Rao Committee (1995)** reported in its report entitled reassessing the technical education crisis that ‘There is a considerable distortion in the technical manpower generation. Infrastructure facilities available in a vast majority of the technical institutions are alarmingly inadequate. The quality of education in most of the institutions is poor. The teaching competencies is low’.

**Mashelkar (1998)** report was entitled, ‘Strategic Road Map for Academic Excellence of future RECs’. As recommended by this report since 2002 the government has upgraded in phases, all the 17 REC to National Institutes of Technology. This upgradation has been done on the lines of the prestigious IITs, after it was concluded that REC’s have immense potential as proven by the success of their alumni and contributions in the field of technical education. Subsequently it is provided with more working autonomy and have been granted deemed to be university status to award their on degrees.

**Birla-Ambani Report (2000),** that was presented to the Prime Minister’s Council of Trade and Industry stressed that engineering institutions should be organized by private enterprises, and NRIs may be permitted to open and run technical and engineering institutions at their behest. Those institutions that have been
accredited higher by NAAC may be given independent status as deemed universities, so that they should be able to take independent initiatives for the development of engineering education as required by the new environment. In this connection it was also recommended that the status of Regional Engineering Colleges may be raised to that of Institutes of Excellence. These institutions would serve the nation with new innovations in the engineering education and provide efficient faculty to the other engineering education institutions in sufficient number. Moreover these institutions must be provided with funds required for excellent laboratories, libraries for the faculty to attract the most efficient and intelligent individuals from the national and foreign academic institutions.

In 2002, The U.R. Rao Committee reviewed the performance of the AICTE and drew attention to the unsustainable expansion of technical education. The committee strongly recommended that quality in teaching must be maintained and desired fee levels may be stabilized in the engineering institutions. This report also revealed that there were not enough engineers with higher qualifications to teach in the institutions.

The Department of Technical Education, Punjab formulated Technical Education Policy (2003) with the following principles:

i. To develop a Technical Education System which is responsive to the new innovations in technologies, contemporary industrial culture, globally competitive
market and liberalized economic environments. The output of such system must cater to the actual need, requirement and expectations of the local as well as global industry.

**ii.** The technical education system should be demand driven, market based, self sustaining system.

**iii.** Instead of creating new institutions, more attention needs to be paid on the consolidation of the existing infrastructure.

**iv.** To develop mechanism for up-gradation of skills of existing technical and skilled industrial manpower at all levels through Continuing Education Programmes specially designed for industry.

**v.** To bring about improvements in Technical Education System by strengthening, re-organizing and reorienting the existing administrative structure, and establishing facilities for internal maintenance of equipment machinery and buildings.

**vi.** To undertake Industry Institute Interaction Programmes and carry out industry sponsored R&D projects.

**vii.** To reduce subsidies in professional education in a phased manner during next five years through fee revision, while introducing an elaborate system of liberal
merit scholarship and soft educational loan schemes for financially weaker sections of society.

\textit{viii.} To make the Technical Education System self supporting and self financing to the maximum extent.

\textit{ix.} To encourage private sector participation in technical Education on a self sustaining basis without Government support.

\textit{x.} To impart superior and improved skills to Punjabi youth through practice based industry oriented teaching as per the present day requirement of industry for better employment opportunities in the National and International job market.

\textit{xi.} To take steps for providing entrepreneurship and business oriented technical education for ensuring gainful self-employment in preference to the wage employment to the trainees.

\textit{xii.} To take steps for constant faculty development and upgrade their skill levels.

\textit{xiii.} To provide vocational training through non-formal programmes to help persons having specific technical skills for better self employment and job employment opportunities and contributing to the overall development of the State particularly in the Rural Sector.
Department Related Parliamentary Standing Committee regarding Human Resource Development (HRD’s) report (2003) laid stress on government & private initiative in setting up engineering institutions in North East region. Moreover this committee also recommended that there should be uniformity in all India level for eligibility criteria for admission in engineering education. On the recommendations of the committee, AICTE had framed regulations in norms and guidelines for fees and admission in engineering institution. [In the year 2002-03 a Common Entrance Test for admission in engineering colleges (AIEEE) was started]. The committee also took many steps in respect of career advancement and modification of pay scales for the faculty of engineering colleges. Beside this accreditation had been made mandatory to maintain the quality of all institutions. Another recommendation given by the committee was regarding giving grant and autonomy to engineering institutions possessing adequate infrastructure and competent faculty, etc. Another recommendations made by the committee was that shortage of funds could be tackled through generation of resources by the institutions themselves through industry-institute contacts, generation of technology for the industry and renting of the labs etc.

‘V. Moily Committee’ (2006) gave its recommendations regarding reservations for OBCs in a phased manner in the institutions. Another suggestion made by this committee was that
the cut-offs for admission should be somewhere between those for the SC and ST categories and the general category so that reservation does not compromise the quality of education. The implementation of the quota in the IITs should be left to their discretion. The new reservation process may cover all central and elite institutions like IITs and are to be accompanied with a 54% expansion of seats in order to ensure 27% quota for OBCs. Besides recommending a liberal financial package for the expansion of plan, the committee was also understood to have suggested liberalizing the retirement age of faculty & re-employment of retired faculty.

The high powered committee headed by Justice Rajinder Sachar (2006) has investigated the social, economic and educational status of Muslims. The committee has recommended that it is necessary to increase the participation of Muslim community in engineering education, which is a minority in India.

Moreover Fee Waiver Scheme (2008) was initiated by Government of Punjab to provide free technical education to meritorious students belonging to the categories of economically weaker, physically challenged and women. Under this scheme the eligible students admitted in undergraduate courses would get monetary benefits of Rs. 1.80 lacs (Rs. 45,000 per annum) for four year degree courses of engineering and technology. Moreover the students admitted under the scheme would be provided free boarding and lodging, subject to availability or provision of funding
from government or individuals or NGOs. It should be noted here that during 2008-09 as many as 5% under graduate students were granted tuition fee waiver benefit against nearly 2000 seats under this scheme owing to lack of initiative on the part of college managements and delaying issuance of notification by the government. After this, now the government has made it mandatory for the institutions to publish the scheme in their brochure and website and to advertise about it through the newspapers.

Further, National Knowledge Commission (2008) under the chairmanship of Mr. Sam Pitroda recommended that there was a need to establish an Independent Regulatory Authority for Higher Education (IRAHE) to overall streams. The role of the standing committee on Engineering Education under IRAHE would be to exercise due diligence at the point it approved entry for an institution to grant degrees/diplomas. The member of the committee should be comprised of eminent educationists, educational administrators and management specialists drawn from industry. The committee would follow transparent and uniform processes under the overall supervision of IRAHE. The committee would also determine the criteria and the processes of accreditation and license multiple agencies for the same. A mechanism for ranking of institutions to enable students to take informed decisions at the time of admissions by stipulating grading norms and nominating independent rating agencies was also recommended to be
established. These initiatives would enable the AICTE to focus on important issues such as curriculum development, pedagogy, faculty development etc.

Moreover it was also recommended that in order to encourage greater flexibility and autonomy, there was a need to progressively do away with the system of affiliation of engineering institution / colleges to the universities where feasible, they should be given full autonomy. To attain greater transparency and accountability, it should be made compulsory for all engineering institutions to display information about their building, labs, faculty, intake of students, performance of student, recognition status and placements on their websites.

Furthermore, it was also recommended that the current curriculum should be modified to provide greater flexibility, interdisciplinary perspective and choice of electives. The focus in the teaching/leaving process should be on integrating skills such as problem solving and logical reasoning process orientation, learning ability, English communication and programming fundamentals, industry participation to discuss real life case studies should be encouraged. Laboratory courses must be revamped to develop a healthy attitude towards experimental work environment must be created to encourage students to participate in co-curricular activities.
The NKC also gave detailed recommendations about integrating science and engineering education, encouraging research, industry-academic interactive, interaction, improving access and mentoring role to be played by NITs and RECs.

February, 2009 meeting of CABE (Central Advisory Board on Education) noted that government had decided to setup eight new IITs in Andhra Pradesh, Bihar, Rajasthan, Orissa, Punjab, Gujarat, Madhya Pradesh (Indore) and Himachal Pradesh. Apart from there it was also noted that IISERs at Mohali, Pune, Kolkatta, Bhopal and Thiruvananthpuram had started functioning from temporary premises. Moreover to adverse the increasing skill challenges of the Indian IT industry and growth of the domestic IT market, the Ministry of Human Resources Development (MHRD), Government of India intended to establish twenty Indian Institute of Information Technology (IIITs) during the 11th Five Year Plan Period, on a Public Private Partnership (PPP) basis. The process of opening of nine NITs was also started. The approval was also granted for the establishment of Ghani Khan Chaudhary Institute of Engineering and Technology (GKCIET), Malda in memory of Late Shri Ghani Khan Choudhary, former Union Minister.

Yashpal Committee (2009) has recommended IITs should not be meant for the isolated study of engineering only, rather they should produce scholars in literature, linguistics and politics along with the engineering.
5.6 RESULTS AND DISCUSSION:

The study of policy perspective in engineering education has led us to some significant results about the government’s policy after independence and its impact on the technical and engineering education in the country in general and Punjab in particular.

In the pre-independence period, the industrial policy of the British Government has been based on the interests of British Capitalist Class and India has been treated as a market for exporting raw materials to England and importing many manufactured goods from England to India. Therefore the required industrial development in India could not take place. Such a situation has not encouraged any type of development in Indian Engineering Education. However few institutions of engineering and technology have been opened in major cities of the country before independence.

Then, after Independence the policy of the government has been oriented towards the development of industrial base of the country. Therefore, it has also been realized by the Indian government that if all the industries have to be run properly there has been a need of a large number of well trained engineers. Thus after independence in order to provide engineering education, a number of public institutions have been opened and trained engineers have been prepared in large quantity to meet the requirements of the new industry.
Moreover, different five year plans have laid stress on various aspects of technical and engineering education for its further development. During the first two five years plans a long term planning has been done for the development of technical and engineering education and IITs and Regional colleges of engineering have been established. The successive five years plans after this have paid attention to industrial development, teaching and research programmes, scholarships and fellowships for talented but poor students, pre-service and in-service training of engineers in industry, training of teachers, checking the mismatch between demand and supply of engineers, development of autonomous colleges and review and monitoring of the engineering education. Moreover the last and eleventh five year plan has also laid stress on the review of status of engineering education, to critically examine the issues of access, quality and relevance, removal of obsolescence and modernization of labs, workshops, libraries, computer facilities, international bench making and effective transparent accreditation.

Further, taking into consideration the need to grow and develop engineering education after 1947, a number of commissions and committees have been constituted by the government of India for spreading technical and engineering education. On the recommendations of the initial commissions and committees the government has taken the initiative in its own hands and has spared sufficient funds for establishment of engineering institutions. But
after seventies private entrepreneurs have also started taking the
initiative to establish engineering institutions. Moreover after the
adoption of the neo-liberal policies by the government of India in the
earlier nineties the field of professional education in India has been
dominated by the private initiative and engineering education has
been no exception to it.

It is also very significant to note that in the recent years the
government has started including the people from private sector in
the committees and commissions for policy making for higher and
technical education, which has adversely affected the policy against
the common man as in case of Ambani Birla Report and National
Knowledge Commission Report we can easily observe the reflection
of interests of the capitalist class.

Furthermore, before as well as after independence especially
until nineties most of the engineering institutions have been opened
in the southern states. But as the development of the country
catch speed and a variety of goods have been to be manufactured;
more and more engineering institutions have been opened in other
parts of the country also. But it has happened only after the late
eighties in Punjab that the number of engineering institutions have
started increasing. However after nineties it has caught speed and
resulted in the mushroom growth of institutions due to policy of
allowing the private initiative in the professional education. Even the
institutions of excellence like IITs, IISC, IISERs, and IIITs have not been evenly distributed over the different states and regions of India.

Last but not the least, central as well as Punjab government have slowly reduced subsidies in engineering education in a phased manner during the recent years through fee revisions in the public institutions. However a system of merit scholarships, educational loans and fee waiver schemes for the financially weaker sections of society have been introduced by the both the central as well as the state government. Therefore if the necessity, capacity and performance are taken into consideration we as a nation, have to work a lot more to achieve the goal equity in the field of engineering education.