CHAPTER – II

REVIEW OF RELATED LITERATURE

The success of any research study depends on the extent to which the advances, both empirical and the theoretical have been, made by the previous researchers and authors. Since survey of related literature helps us to show whether evidence already available solves problems adequately without further investigation and thus may also suggest the method of research appropriates.

Therefore it has been thought to be appropriate to shift the relevant facts regarding the present study from the mass of research evidence to this chapter so as to formulate the proper objectives in order to provide an outline for the successful execution of the investigation.

Research literature related to engineering education, that has been identified under the present research problem may be classified as per given below:

1. Issues related to General Growth and Development at the National Level
2. Issues related to General Growth and Development at the Punjab Level
3. Issues related to Quality
4. Issues related to Equity
5. Issues related to Financing
6. Issues related to Placement

This framework has been used for classifying the available related literature and the studies that have been completed over the years in the field of engineering education and are surveyed in the present review report.

2.1 GENERAL GROWTH AND DEVELOPMENT OF ENGINEERING EDUCATION AT THE NATIONAL LEVEL

According to Government of India Report (1964) the development of human resources in the form of properly trained scientists and engineers has been the most essential prerequisite for sustained industrialization. This has led to the massive expansion of technical/engineering education in India up to the highest levels. According to Council of Scientific and Industrial Research’s (CSIR) report (1984-1989) India was exploited by the Britishers before independence for their own interests. They have not taken any interest in the establishment of engineering institutions in the country. But after independence, there has been tremendous growth in engineering institutions. A total of 46 engineering and technology institutions were established by the time India attained independence in 1947. Most of them were having only bachelor’s degree level programmes. Four of them had Master’s degree level programmes also. However none offered the Doctorate degree programme. Soon after independence India launched a programme both for expansion and diversification of engineering and technology
education. In the 18 years between 1947 and 1965 the number of engineering and technology institutions increased 3 fold. Between 1950 and 1965 on an average, 6 new institutions were established each year. Between 1965 and 1983, there occurred a doubling of engineering institutions. More than 20 engineering institutions were added each year between 1980 and 1985. In 1989 there were 383 institutions offering various types of tertiary level courses in engineering. Majority of them (372/383), offered bachelor level engineering education. A total of 143 institutions including the 11 which did not offer the bachelor level courses were giving either master’s level degree courses or post graduate diploma courses in engineering. Seventy four institutions offered doctorate level courses.

According to Chatterjee (1986) only an industrialized economy can provide sufficient resources for the balanced satisfaction of wants of all sections of society and engineering education can play a very significant role in this regard.

Chugh (1992) and Sonda (1998) prove that with the impact of information technology and integration among the nations the importance of engineering education has increased much. Chugh lists three significant opportunities for India in the emerging scenario if it can produce required number of engineers & technocrats.

i. Opportunity to become the premier production centre of the world.
ii. Opportunity for Indian corporations to go into world markets and to become India’s multinationals abroad.

iii. Opportunity to attract foreign investors to make India their home base for the world markets.

Qureshi (1996) while reviewing the reports of the TVET (Technical and Vocational Education Training) programmes and case studies of various countries in the Asia-pacific region remarks that there is a growing awareness in countries of Asia-pacific region for the need to adapt technical and vocational education to meet the rapidly changing requirements of the economy at the national, regional and global levels. The significant trends listed by him are:

i. Increased co-operation between technical and vocational education authorities and those in industry and the market place has progressively become a factor in several systems for updating curricula, equipment and facilities, as well as in introducing new programmes and cost-effective delivery approaches.

ii. There is an increasing awareness in the region that new information technologies are essential to improve the effectiveness of TVET systems and to make them more flexible and learner-oriented so as to promote life-long learning process. TVET curricula content is also evolving rapidly.

iii. Course designs are oriented more towards a combination of core and elective components as well as competency-based training, so that they are more responsive to the needs of rapidly transforming economies.

iv. Curriculum planning priorities in most countries now place emphasis on the need to link education to enterprises, particularly in regard to orientation and the study of business economics for small enterprises and life-long education.

v. There is a new trend in many countries to provide contextual learning and also integrate traditional
disciplines into one single course (for example, “mechatronics” based on mechanics and electronics).

vi. There is increasing emphasis in some countries, especially in Australia and New Zealand, on preparation of multi-skilled work force, providing job experience required for upgrading of skills, creating mechanisms for the recognition of existing qualifications and credit transfer, introducing competency-based training, and promoting retraining.

vii. In some countries, such as the Republic of Korea and Singapore, training content is increasingly selected not only for its relevance to specific jobs but also for job clusters, as well as for the transfer to jobs from related areas in business and industry.

Sonda (1998) explains that the advent of information technology has played an important role in the field of engineering education. Many changes have taken place after the introduction of Information Technology like rapid increase in number of engineering and Information Technology colleges, massive increase in students admissions, growing emphasis on newer areas like electronics and telecommunication engineering, etc.

Walia (1999) has studied the development of education and socio-political change in the Punjab from 1882-1947. He has found that it has been not British Government’s aim to bring advancement in technology but their need that vocational schools and colleges were established. The scientific training has been so poor in the pre Independence times that until lately, a man might become a B.Sc. without having touched a test tube. No adequate facilities existed for engineering education which otherwise is a significant branch of the technical education. Elementary types of education has been given
in classes held at ‘Mayo’ College, Lahore which were financed by the Punjab University. These were taken over by the Director of Public Instruction (DPI) in 1904-05 and organized as Government School of Engineering. In 1911-12 the school has been shifted to Rasul. The school prepared students as overseas and draftsmen. Another Institute imparting in instruction in Electrical and Mechanical Engineering has been the Victoria Diamond Jubilee Hindu Technical Institute, Lahore, founded in 1897-98. The Institute turned out Mechanical and Electrical Engineers and trained Mechanics. A four year courses has been designed for Engineering and three years course for trained Mechanics. However a long standing desire for a higher institute of engineering has been fulfilled in 1922, when the ‘Maclagan College’ of Engineering has been started at Mughalpur near Lahore to impart theoretical and practical training in Electrical Engineering. There has been not unemployment among the qualified men, rather there has been a acute shortage of properly qualified candidates for employment. Slowly the policies of British Government changed and they started giving some importance to engineering education and the nineteenth thirties. Metal works Institutes of Ambala, Woodworks Institute, Jalandhar, Government Institute of Dyeing and Printing at Shadra, Government Central Weaving Institute, Amritsar and Government Training Institute, Jalandhar were established. But Walia concludes that the overall
position of technical and engineering education has been far from satisfactory during the colonial rule.

Ahluwalia (2002) reveals that private rather than public investment has been positively and significantly correlated with state level growth rates in engineering education in the fourteen Indian states that he has studied. He views that private organizers are taking a keen interest in opening new engineering institutions to earn big profits.

Kukreti (2003) maintains that independent India has paid a lot of attention towards the growth & development of technical education after 1947. The southern region has the largest number of technical institutions at all levels–MCA institutions, degree and diploma level institutions. Out of total 865 institutions running MCA courses in India, about half of the total numbers i.e. 432 are situated only in south, whereas part of India had only 42 such institutions, which 4.86 percent of the total. After 1950-51 the number of girl students in engineering institutions has increased rapidly, but in comparison to boys enrolment in these institutions the proportion of girls enrolment is not satisfactory.

According to Praveen (2003), there is a real boom in growth & development of engineering education since 1980. Not only is there an addition to the number of institutions with corresponding increase in the intake and out turn, there has been significant addition of new courses to existing ones from time to time. He also
describes that employment opportunities for engineers also vary from state to state.

Srivastava (2003) views that facilities for technical education specially engineering education in different states need to be related with parameters like population, net state domestic product, enrolment in XII class in science stream, employment and new emerging technologies. While developing the facilities developed during the last 10 to 15 years these parameters have not been taken into account rather the policies for development of engineering education have been based on infrastructure norms and standards, controlled by statutory bodies. Those policies have been financially highly rewarding. Indian society had got ample access to socially acceptable technical education. But on the other hand, in the absence of demand and supply mechanism unbalanced growth has taken place.

A study conducted by Dhawan (2004) depicts that 2000 seats are vacant in engineering colleges especially in Haryana state. The institutions authorities can fill these seats at their level's best but the national level tests are mandatory, therefore the institution are not permitted to do that, consequently has beentage of resources is there.

Banerjee (2004) says that due to globalization and structural changes the country needs skilled persons. There is no doubt that many institutions are being opened by private enterprises, but the
distribution pattern of these institutions is skewed in favour of the south and the south west.

Kumar (2005) reveals that shortage of technical manpower will have an adverse effect on the industrial as well as economic development of the country where as surplus may cause among other things, unemployment in such highly qualified manpower and also involve has beentage of time, money and energy spent on its development. The study observes that electronics engineers will be in surplus even if the admissions to the course of the degree level is maintained at the current level. Hence, there appears a need to regulate admissions to the degree level programmes to electronics engineering so as to avoid mismatch between demand & supply, both current & prospective.

A report given by Sharma (2006) depicts that the AICTE has reduced the total number of seats in some private colleges in Punjab due to lack of proper infrastructure. Although he treats it as a wake-up call for the engineering institutions to equip themselves as per the norms of the statutory body.

A report of AICTE (2009) has revealed that it has planned to assist financially those engineering institutions which are situated in those areas where the educational institutions lag behind the advanced states. The council has envisaged the following schemes to overcome the problems.

1. Modernization and Removal of Obsolescence (MODROBS)
2. Staff Development Programme (SDP)
3. Emeritus Fellowship (EF)
4. Entrepreneurship Development Cell (EDC)
5. Industry-Institute Partnership Cell (IIPC) especially for initiating skill development programmes and activities

The council has also stressed the need of establishing engineering education to the underprivileged section of society in which rural, female and backward classes would be especially assisted.

Central Advisory Board of Education (CABE) (2009), in its fifty fifth meeting, has noted that the Government has decided to set up eight new IITs in Andhra Pradesh, Bihar, Rajasthan, Orissa, Punjab, Gujarat, Madhya Pradesh (Indore) and Himachal Pradesh. Out of these 8 classes for B.Tech courses have been started from July-August 2008 in 6 new IITs in Andhra Pradesh, Bihar, Rajasthan, Orissa, Punjab and Gujarat. These are being mentored by the existing IITs in Madras, Gawahati, Kanpur, Kharagpur, Delhi and Bombay respectively. Classes of IIT Andhra Pradesh, Bihar and Gujarat had been started from temporary premises while the classes of Rajasthan, Orissa and Punjab have been started from the campuses of their respective mentoring IITs. Sites for new IITs in Bihar and Andhra Pradesh have been identified at Bihta in Patna and Medak respectively. Committee for identifying the sites, has visited the sites suggested by State Government of Madhya Pradesh
(Indore), Punjab), Orissa and Himachal Pradesh. It has been decided to start the classes the B.Tech courses in IIT Himachal Pradesh and IIT Indore from academic year 2009-10.

To address 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 Institutes of Information Technology during 11th Five Year Plan Period, on Public Private Partnership (PPP) basis.

It has also been noted that the process of opening of new NITs has already been initiated. In this regard Hon’ble Union Minister of HRD had written letters to Chief Ministers of 10 states / UTs which do not have a NIT to send proposals for opening of an NIT in their states / UTs vide letter 19.07.08. Approval had also been 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.

A news report in Hindustan Times (2009) states that the University Grants Commission (UGC) which is a regulator of higher education in India, has planned to rein in skyrocketing fees in Deemed Universities and make their controversial admission process transparent. The report quotes the chairman of UGC Prof. S.K. Thorat commenting that “No government regulations are applicable to institutions runs by Deemed Universities”. The 127 Deemed
Universities run around 200 medical, engineering and management colleges around the country. Prof. Thorat has explained about the new plan of the UGC for the Deemed University that either they would have to pick upto 80 percent of their students from the existing all India engineering and medical tests or they would have to start their own entrance examination system and the rest 20% seats would be left for management quota.

A public notice (2009) has been given through the leading dailies of the country titled, ‘Attention to AICTE approved technical institutions, regarding matters concerning charging of fees, refund of fees and other student related issues’. The notice has been issued with the aim to alert the AICTE approved technical institutions which do not follow the instructions given by it regarding commercialization of technical education. It has been mentioned in this notice that some AICTE approved technical institutions have been admitting students to technical education programmes long before the actual starting of an academic session; collecting full fee from such admitted students; and, retaining their school / institutions leaving certificate in original to force retention of admitted students. AICTE has warned the approved institutions not to indulge in such commercial activities and it has been stated that if any institution is found guilty of not following these instructions a punitive action could be taken against it.
2.2 GENERAL GROWTH AND DEVELOPMENT OF ENGINEERING EDUCATION IN PUNJAB

According to a Government of Punjab Report (2002), The Bhakra Nangal Dam which had come into existence in 1950’s needed more hydraulic engineers & civil engineers. Secondly Punjab also needed national highways to link itself with the other states of India. All these developments made the engineering education essential and therefore the government of Punjab established “Directorate of Technical Education” in 1977 to cater to the needs of scientific and technical education. After 1980 the Government and private bodies paid more attention to engineering education and many colleges in different districts of Punjab were opened. In 1996-97 another big step has been taken by the Punjab Government; Punjab Technical University has been established at Jalandhar and most of the engineering colleges of the Punjab were affiliated to it. There is no doubt that these institutions are fulfilling the needs of engineering education in Punjab but qualitatively they are far behind the expected standards. In these colleges there are trades that are lapse needed and they lack branches of engineering education that are the need of the hour in this era of globalization. The education imparted by these colleges is substandard because these have been opened with the primary motive of making profits. Therefore most of the self financed institutions are unable to provide quality-engineering education to the students of this area. In addition to it
Punjabi University, Patiala, Punjab Agricultural University, Ludhiana, Guru Nanak Dev University, Amritsar also started certain technical courses on the campuses. Thus in 1990 a minimum basic infrastructure has come into existence. Punjab has witnessed the growth of all types of institutions in the 1990s when the communal frenzy has been controlled by the government. At present Punjab is having the following six types of degree level technical institutions:

1. Run by Punjab Government
2. Run by Central Government
3. Run by Universities
4. Deemed Universities
5. Run by Private managements and aided by Punjab Government
6. Run by Private managements through self financing

The quality of engineering education provided by these institutions varies from one institution to another. Self-financed institutions are charging huge amounts of fees from the students and therefore the lower middle class people are unable to get engineering education. Moreover the number of technical education institutions has increased in Punjab so sharply that the number of seats available in these institutions outnumbers the eligible applicants for admission.

According to a report of Directorate of Technical Education, Punjab (2004) as far as technical education at degree level in Punjab
is concerned no attention has been paid by the British Government during its rule. It has been after the independence of India that the National Government took Punjab into consideration for the development of engineering education so that it may also contribute towards the national industrial development. A new city known as Chandigarh has been built and in it Punjab Engineering College (PEC) has been established in 1953. Prior to India’s independence it has been called the Maclagan Engineering college and has been located in Lahore. In 1947 it has been moved temporarily to the mountain town of Roorkee and functioned for sometime in the Thomson College Campus. This college imparts quality engineering education and it has become part of the union territory after reorganization of Punjab in November 1966. A second prominent institution has been established at Patiala in 1956 by an industrialist whose name has been L.M. Thapar. The institute has been named “Thapar Institute of Engineering and Technology”. A third institution of engineering & technology has been established at Ludhiana in 1956.

Singh (2005) mentions that three types of industries are required for the development of state of Punjab, agro based industries, mass needs based industries & agricultural needs based industries. Thus engineering institutions must provide education & training program for achieving this goal.
According to Gill (2005), AICTE has instructed to reduce nearly 900 seats of 14 engineering and Management Colleges in which the faculty members are less than 25% of the required faculty and infrastructure is inadequate. According to the Registrar, Punjab Technical University, Jalandhar, besides reducing the seats in the existing colleges AICTE has issued a warning to the newly opened institutions where the maximum seats were left vacant during the last academic session to either fill the seats by the end of the current year or face action.

Chitleen (2006)’s report reveals that engineering colleges in Punjab affiliated to PTU are able to fill only fifty percent of the seats. The most popular branches among the students were the CSE, ECE and Mechanical.

Malhotra (2009) reported that the Punjab Government in its initiative to provide free technical education to meritorious students, instructed Deputy Commissioner state wide to complete the admission process for diploma and degree courses upto graduation under tuition fee waiver scheme by August 6. According to this report nearly 6000 deserving students (3000 each in diploma and degree courses) would be benefited under the waiver scheme. A committee headed by the Deputy Commissioner of the respective district under which the institution falls and chairman of the Managing Committee of the institution would carry out the admissions. Under this scheme the eligible students admitted in
undergraduate courses would get monetary benefit of Rs. 1.80 lakhs (Rs. 45,000 per annum) for four year courses. The notification said that tuition fee, institutional charges (not specified), transportation (Rs. 3.00 per annum) and university funds (Rs. 275 per annum) would be waived for economically backward students while women and physically challenged students would avail the benefit of tuition fee waiver only. The rules said that for every 60 sanctioned intake in a discipline, tuition fee waiver would be given to two women candidates, three economically weaver students (annual income of parents from all sources should be less than 2.50 lakhs) and one physically challenged student based on merit, through counseling. In the event of non-availability of students in a specific category, the benefit will be given to any other categories, according to the merit. Moreover the institution in turn, would be allowed to admit 10 percent of its sanctioned intake or the number of actual tuition fee waiver granted, whichever is lower, as an additional intake in the same discipline.

2.3 QUALITY OF ENGINEERING EDUCATION

Various institutions of technical education play their role significantly in the economic development and social advancement of the country. The scientists and engineers of today are expected to anticipate, predict and be prepared to solve the future problems. There is a need to review the engineering education system in order to maintain the quality of education.
According to Kothari Commission (1964), Engineering Education plays an effective role for industrialization. The success of industrialization depends upon ability and skill of the workers that further depends upon the quality of engineering & technical education provided to them. The commission has recommended that 20% of the students after receiving their education at the secondary stage and 50% of the students after receiving their education after class X must have adopted professional and technical courses by the year 1986. The commission has also recommended that an eminent educationist should be appointed on the post of the president of the Board of Governors of Regional Engineering Colleges. The Principals of the colleges should be fully empowered to provide educational facilities in their institutions. Practical training should be imparted in the third year to the students of degree courses. In workshops, emphasis should be given on production works. The curricula of the degree should be determined keeping in view the changing needs. The system of frequent transfers of teachers in Government Engineering Colleges should be stopped.

The acid test of the success of technical education lies in the quality of the training. NCERT studies (Sen Gupta, M. and Dhote, A.K.1990, Chopra, R. 1990, Mishra, C.K. and Verma, B. 1990, Sacheti, A.K. and Vaid, D.K. 1990) in many states have brought out the fact that while a few institutions have organized effective training in each of the states, the quality of practical training has left much
to be desired in the majority of institutions in a number of states. Issues like provision of entrepreneurship and self employment support, availability of suitable instructional material and teacher training, employee’s assessment of quality of training, performance of Vocational & Technical products, on the job training and apprenticeship etc. if studied in depth and feedback is given to the system highlighting the weak points, qualitative improvement can be brought about by undertaking suitable definite actions.

Raviparkasha (1991) has stated that all the engineering institutions in India are facing problems of quality. There is scarcity of qualified and experienced staff. Due to paucity of funds the quality and social relevance of education imparted in our institutions remains quite low and has been deteriorating.

According to Sharma (2001), engineering education is faced with many problems such as low quality, lack of practical experience, no intimacy with industry, old and defective curriculum, problem of medium, problem of administration and control, problems relating to research, unemployment etc. and in order to have qualitative improvement these problems have to be checked.

Shrivastav (2003) has described that there is a shortage of teachers in engineering colleges. Country will need about one Lakh teachers for degree level institutions by 2006, against existing 35000 teachers today. The intake capacity of degree level is expanding at a very fast rate but rate of supply of teachers has been extremely slow.
As per AICTE norms, professors and readers must possess Ph. D. and accordingly we need about 40 thousand Ph. D. qualified teachers. According to a study, India has awarded only 10,000 Ph. D. degrees in engineering since 1966 till 2000. 75% of these were awarded by IITs and IISc. It is estimated that at the rate of awarding 600 Ph. D.’s per year by 2005 the total number would reach to 13000. All (Ph. D.) degree holders don’t become teachers. The study also revealed that 75% of our Ph.D. qualified teachers are working in all IITs, 10 – 12 Technical Universities and 17 Regional Engineering Colleges. By and large only lecturers either qualified or experienced are teaching subjects of modern technology areas. Several of them are only fresh graduates. Very few are post graduates. These teachers are also not paid pay & allowances as prescribed by AICTE. They may be on contract for ten months and are paid renumeration on period basis. There are also no qualified paper setters and examiners, resulting in delay of declaration of results by the universities which further leads to poor quality of engineering education.

Hariharan (2003) views that due to various reasons there has been deterioration in the quality and standards of technical education. It is primarily due to insufficiency of financial input to system. The efforts of WTO to include education in the GATS agreement should be taken seriously. Due to competition with other
countries. Indian educational institutions must prepare to appoint specialized faculty and to implement research oriented curriculum etc.

Karuppayal (2003) opines that barring a few institutions the majority of the institutions, which have opened, their shops at multiple locations do not offer excellent program worth the fees they are charging. Most of the engineering institutions that run the fashionable courses for high fees, lack in infrastructure or in qualified and experienced faculty. The program is taught by under qualified or faculty hired on contract basis. The teachers many times are fresh postgraduates who are paid meager salaries that may be less than that of an unskilled worker. Some times retired teachers are hired. These are exploited and are at the mercy of their management. Often the syllabi are excellent but taught by ill qualified or less qualified people. Research has taken a back seat in many of the institutions where faculty recruitment has not happened for many years. In places their contributory teachers handle classes; research is out of question. This has greatly affected the quality of the students coming out of these institutions. The idea that quality may improve due to private participation has proved to be untrue. Privatization in engineering institutions in our country has clearly become a license for money making and exploitation.

Kulandaisamy (2003) has argued that all engineering colleges be granted academic autonomy and gradually do away with affiliated colleges to Universities. As a first step all leading private institutions
must be converted as deemed technical universities. Market forces will ensure that only those maintaining quality will survive by attracting good students and faculty. AICTE should ensure that all private colleges maintain stipulated quality. Present status on this front leaves much to be desired. Periodic monitoring and assessment must be carried out to maintain or continue their recognition / approval.

Human Resource Developments Report (2003) illustrates that both government and private initiative in setting up institutions in north-east region on self financing basis by Trusts and Societies is being encouraged. Granting autonomy is the other recommendation for those institutions possessing adequate infrastructures and complete faculty which are accessed through accreditation of the programmes and expert committee. Major concerns like delay in admission, delay in beginning of academic session, reduction of academic days required for semester, non uniformity in basic structure of curriculum etc. have been alleviated. It has also been recommended that heads of technical universities will be eminent experts in the field of engineering education. Another recommendation of the committee is that shortage of funds could be tackled through generation of resources by the institution

Hariharan (2004) is of the view that in the developing countries, engineering education and the people responsible for it are being increasingly criticized for not being in tune with the
practice of the profession. The main difficulty appears to involve a mismatch between the education imparted in the technical institutions and the activities of the engineers in the industry. It is often pointed out particularly by industry that much of our engineering education is irrelevant because most of the engineering teachers are not practicing engineers.

Vishwanathan (2004) reports that the Subramani Committee (The Permanent Committee for Common Entrance Test for Private Educational Institutions in Tamil Naidu) ordered on June 14, 2004 that admission to engineering colleges under the management quota should be done under the Single Window System and that the consortium of self-financing professional colleges in Tamil Naidu should conduct the common entrance test for admission to all self-financing Engineering Colleges in the state. Referring to the specific conditions laid down by the Supreme Court the committee said, “Merit has to be assessed only on the basis of one test”. The managements of several self-financing engineering Colleges have challenged the orders of committee.

According to Dharamvir (2005), “India has a large pool of world class institutions but not enough world class institutions. Admission in these institutions assures students of a good career and migration to many foreign countries. It is but natural for aspirants to cash on this brand”. He further appreciates the present IITs, because of their excellent faculty, diversified courses and a foolproof system of
examination. He is of the view that some more IITs should be established in order to produce highly qualified and fully efficient engineers of the type of world-class institutes M.I.T. in the US. The author has also suggested that some top most management courses may also be started in these institutions.

Kashyap’s report (2005) reveals that AICTE has asked 73 institutions in Maharashtra to reduce their intake capacity by 5375 seats. The reason behind this move is poor infrastructure and shortage of faculty in the engineering institutions.

Singh (2005) throws light on the poor quality of engineering education system. Most of the colleges are unable to function according to the norms prescribed by AICTE. AICTE should ban the opening of new colleges because these colleges have no proper infrastructure. He suggests that AICTE should implement grading system for evaluating the college functions. The institutions should present their annual reports as instructed by AICTE. AICTE should launch a fellowship scheme for initiating master degree programme

Ghose’s (2006) study revealed that in most of the places of excellence that currently exist in India, salaries were not the most critical factor in determining the quality of or success of the faculty. He also emphasized the importance of academic and other freedoms, social dignity and physical facilities, etc.

Sandhu (2006) reports that the mushrooming of private institutes in Punjab after the setting up of PTU looks like blessings
for the state youth; considering the phenomenal growth in IT industry. The quality of education being provided by the institutions affiliated to PTU, coupled with government apathy, and would only produce an army of educated unemployed. But at the same time, if the university took it upon itself to improve the standards of education by upgrading the infrastructure, appointing quality teaching staff and redefining the syllabus.

Sridhar (2006) is of the view that when institutions of foreign countries enter engineering education in India. They are sure to provide better facilities to the students of engineering in every respect. The Indian engineering institutions will have to compete with them. They will be only successful if they provide better facilities to their wards.

Kumar (2008) has found that most of the private engineering institutions do not provide competent and qualified faculty because they do not want to pay the required salary to the well qualified teachers. The qualified engineers prefer to serve the private companies where they are paid much more than these institutions in the form of salaries and other perks.

In a report in Hindustan Times, Malhotra (2009) has revealed that the parliamentary standing committee on Human Resource Development had wrapped the All India Council for Technical Education (AICTE) for “It’s failure to effectively regulate technical education and virtually restricting its role to granting approval for
starting new institutions”. It is also reported that the committee headed by Janardan Dwivedi found that the apex body had failed to check the commercialization of technical education. The committee also stated “there are allegations about corrupt practices, including exchange of money over wide-ranging aspects relating to admissions, recognition and approval of new institutions and courses. There is a lot of commercialization especially in engineering and management institutions. Different courses attract different rates the AICTE is also responsible for not regulating capitation fee”. The committee had also asked the council to take a suitable action against such institutions to safeguard student’s future.

2.4 EQUALITY OF OPPORTUNITY IN ENGINEERING EDUCATION

Universal Declaration of Human Rights (1948) in Article 26(1) states that “Everyone has the right to education. Education shall be free at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit”. But such equal access has not been available to the Indian students especially in the field of engineering education which can be concluded from the following review of the related literature.

Shah (1964) reveals that the students of engineering & technical education came largely from upper caste families, residing
in urban areas. Their parents were generally better educated and were largely occupied in high status occupations.

Bottomore (1964) has stated the differences which originate in economic inequalities are enhanced by engineering and technical educational differences.

Naik (1982) describes that in the developing countries like ours, technical education is considered as a speedy vehicle for upward social mobility especially by the socially and economically deprived and under privileged sections. But, in most of the cases the upper & middle income groups demand it more forcefully then other social groups. Nevertheless as indicated by the research studies people belonging to upper socio-economic classes have been the main beneficiaries of technical and engineering education system in India.

Chitnis (1987) has pointed out that engineering courses have been considered more prestigious since they lead to high income and high status occupation. Admission to such courses has been based on stiff competition. Children from poor families are likely to lose out in this competition.

Regarding the socio-economic status of women participation in engineering and the choice of their trades and placement status has been made by Parikh and Sukhatme (1992) show that the percentage of women enrolment in engineering institutions has increased manifold in the last two decades but their share in IITs,
REC, NITs has remained low. The electrical engineering is the most preferred branch followed by electronics, civil and computer, etc in case of women.

Kaul (1993) reveals that in the field of engineering education the dominant castes and classes have played a role in developing engineering education in Karnataka but this role is limited to consideration of caste and class politics, contending the right to equality in Indian constitution. A very high capitation fee is charged from the students and obviously the rich students belonging to the elite class can easily pay it but the lower and poor castes and classes cannot pay capitation fee therefore they cannot get higher and technical education despite the fact that a number of students among them are even more competent as compared to the students of higher classes who get admissions in various trades of engineering in various colleges of the state.

As far as equal opportunity for all the Indians in higher education and especially technical education is concerned, Chauhan (1999) has described the situation in detail, “Prior to independence higher and technical education has been available only to the children of well to do families who found a microscopically small section of our population. Even now the situation is not very different. Research studies conducted by Government organizations have shown that more than 80% of the secondary schools pass outs and over 70% of University graduates come from the top 20–30 % of
the income groups. But the system of higher and technical education is heavily subsidized from the public exchequer to which poor masses make the largest contribution by way of direct or indirect taxes. This shows that the poor people who are deprived of education of all kinds are faced to pay for the education of the well to do through subsidy. This justifies the reduction of subsidy and enhancement of fees. In a democratic society, poor people cannot be taxed for the benefits of the rich.”

Kukreti (2003) has investigated that the number of girls admitted to engineering institutions has not increased at the rate at which the number of total student intake has increased.

Bhunia (2004) has opined that several educational commissions including Kothari Commission have argued for active industry and institute interaction for effective research and development. In this context private institutions play a positive role. He has also observed that in India most of the private engineering colleges offer courses in computers, electronics, IT & other subjects like mechanical, electrical, civil etc. The imbalance so created will have adverse effect in future both in terms of availability of engineers of proportional level and in related expertise and development. The high tuition fees of engineering education in private sector will encourage only affordable societies to opt for. The meritorious poor students will not benefit from these educational opportunities offered by the private institutes. He also suggests a few possible
solutions. According to him the solution lies in the proposed Institute-Cum-Industries (I-C-I). He also tells the idea that to change the admission procedure for engineering education in the changed scenario, the students may be admitted with no branch, after two years of common studies based on grade points earned and choice, the discipline may be allotted.

Mullick (2004) report reveals the tragic situation regarding equality. Almost all the colleges and university teachers belonging to PUTA (Punjab University Teachers Association) declared that, “The writing is clear on the wall. If you belong to a lower or middle class background then you would better forget about higher/technical education”. He further explains that it is because of the fact that the government wants to spend even less than 3% of GDP which is the current measure”. They stress upon self sufficient courses in which the students should bear all the expenditure which is becoming problematic even for the middle class groups not to speak of the labor classes.

Shetty (2006) is of the view that reservation policy has made no negative effect on quality of the engineering education especially in IIT’s. He also underlines the importance of giving the deprived a chance to display their talent. According to him quality of faculty must be the main focus of any engineering institution.
2.5 FINANCING OF ENGINEERING EDUCATION

Mathur (1987) report reveals that the contribution of technological change in the economic growth in India has been quite significant. But the level of financing of engineering education is far from satisfactory.

Dhananjaya (1992) has given a very important suggestion regarding financing of the Indian engineering education. He is of the opinion that engineering education should be financed by a government sponsored bank called Educational Development Bank of India. It will be beneficial to both the financing institutions as well as to the institutions imparting engineering education.

Bordia’s (2000) study reveals the trend in funding Technical and Vocational Education (TVE). Bordia finds that during the past decade, funding mechanisms for universities and technical education institutions and colleges have undergone massive restructuring in developed and developing countries alike. Governmental support has generally decreased, resulting in greater reliance on fee-based education or creation of privately sponsored engineering/technical colleges or universities. The following are some of the trends that will likely result from changes in the funding of technical education: (1) export of education will become an important component of the economics of advanced, rich countries such as Australia, New Zealand, the United Kingdom, and Canada; (2) privatization, commercialization, and marketing of education,
especially business, commerce, and information technology will increasingly play a dominant role in developing countries; (3) quality management in developing countries will also move away from government monitoring to professional monitoring, as is now the case in developed countries; (4) the quality of education in developing countries will eventually be determined by market forces; (5) educational funding from individual family budgets will become increasingly difficult in developing countries as privatization results in increased fees; and (6) education will move from being a totally governmental activity to a more commerce and industry-based activity and will eventually become a service industry.

Ambani and Birla (2002) in their high power report to the Prime Minister on the policy frame work for educational reform suggested that the government can concentrate on primary education sector as per constitutional guarantees and perhaps focus secondary education area too, totally leaving higher and professional education to the private sector. They felt private self-financed universities by legislation is perhaps the answer to the malady.

Hariharan (2003) is of the view that the deterioration in the standards of engineering education is primarily due to insufficiency of financial input to system. The central and state government should take to the responsibility of adequately financing the system. The institutions and the management should also take steps to generate more funds by their own initiative. The educational
authorities must study the system of regulation and accreditation of educational institutions in foreign countries.

According to the views given by Shaikh Saleem (2003) the Government of Maharashtra has been wrongly interpreting the Honourable Supreme Court’s Judgement. In this context Government of Maharashtra’s Higher and Technical Education Department issued a resolution dated 16th April, 2003 regarding the establishment of Educational Institution Regulatory Authority for private aided/non aided educational institutions. It is also shielding its responsibility of giving grants to the aided institutions. The government is trying to shift the burden of college expenditure of salaries and non-salaries on public by enhancing fees under Educational Institution Regulatory Authority. As a result the poor public will be deprived of technical education.

Natrajan (2004) has suggested that technical education should follow all the guidelines by AICTE regarding fee structure. But all the guidelines should be in the form of suggestions and not in the form of order to the institutions. The institutions should adopt a fee structure that is viable for the institutions as well as the students.

Indersen (2004) has stressed upon the need to restrict admission in technical education. He draws attention to two cross currents. One rapid increase in emoluments is tempting more and more youth to join technical education program which offers the best prospects for high wages and the second is dismal growth in
employment. According to him the current enrolment should logically be round 200000 for engineering and architecture, which should correspond to an annual intake of barely 50000, seven times less than the sanctioned figure which he admits that these figures are subject to correction, there is a gross mismatch between what the economy can support and what has been sanctioned by the AICTE and that at least in future the AICTE should as a matter of justice approve expansion of education on a rational basis, and not merely respond to speculative demand to start more courses. He further feels that fees in technical institutions should be pegged to 30% of India’s per capita income, or Rs.6000/- per year and that annual fees charged in private engineering colleges may be even described as anti social. Such high fees he feels is the consequence of the state virtually absolving itself of the responsibility to fund technical education and handing it over to self financing colleges where the students are expected to bear the full cost. He feels that it is unjust and even unwise to make engineering education unaffordable to able but poor students.

According to Rajpurohit (2004) the route to finance Higher Education for students is to make available abundant loans. With corporate scholarships not available in most of the Higher Education institutions and available only to a select few in the reputed institutions, educational loans from banks is the most viable option to students coming from middle income families. On bank loans the
Government of India in consultation with Reserve Bank of India and Indian Bank Association has framed various comprehensive educational loan schemes to ensure that no deserving student in the country is deprived of Higher Education for want of finance.

Varghese (2004) views that there are five different sources of revenue generation (a) Government (b) Students and their parents (c) Industries (d) Alumni and other philanthropists (e) International sources. The contributions from all these sources would include institutional contributions, tuition fees, student’s loans, sponsored activities, chair for academic positions and donations etc.

According to Sethi (2005) the review committee on revitalizing engineering education in Punjab has recommended that the engineering college fee be increased to realistic levels. The committee has suggested that the fee be revised from being barely 1 percent of the recurring expenditure per student per year to at least 20 percent of the recurring expenditure per student per year. The committee has also suggested freeships for economically weak students.

Valiathan (2007) views that due to the financial problems faced by the government, private entrepreneurs must come for opening of new engineering institutions. The government must watch the quality of these institutions and take necessary actions against sale of fake degrees. He also states that the country requires more IITs to control the student drainage.
A report (2008) reveals that hike in fee structure in the institutions of excellence like IITs has been approved. It has been raised from Rs. 25000 to 50000 a year. The reason behind is to facilitate better functioning and finer quality of education.

Central Advisory Board of Education (CABE) (2009) in its fifty-fifth meeting has noted that an allocation of Rs. 2000 crores has been provided in the Eleventh Plan and Rs. 50 crores has been allocated for 2008-09 for new IITs. One post of Director, one post of Registrar and 90 posts of faculty and 30 faculty posts, per year in the next three years have been created in each of new IITs.

Moreover it has also been noted that IISERs (Indian Institutes for Science Education & Research) at Mohali, Pune, Kolkata, Bhopal and Thiruvananthapuram have started functioning from temporary premises. The appointment of Directors of IISERs has been done and allocation of Rs. 150 crores has been allocated for 2008-09 for IISERs.

2.6 PLACEMENT OF ENGINEERING GRADUATES

Chowdhary and Nandy (1974) have stated that qualified scientists and engineers occupy a pivotal position in society and at a given point of time, the higher the degree of malutilization, the higher is the volume of social disaffection generated by the sections affected by imbalances. They have discussed that there is a mass unemployment in the engineering and technology field. They further say that the impact of social tension is that students who constitute
the would be entrants into the labour force tend to develop a morbid attitude towards social goals and practices.

The National Policy on Education (1986) stipulates that graduates of engineering courses will be given opportunities, under predetermined conditions for professional growth, career improvement and lateral entry into the courses of general technical and professional education through appropriate bridge courses but suitable vertical and horizontal linkages on a long term basis have not yet been established although there have been adhoc arrangements to circumvent the problem. Experimentation and research are urgently required to redefine criteria of admission to existing courses, design and develop suitable higher level degree courses, coupled with specially designed placement services.

Mohanty (1992) states that the main aim of a course on entrepreneurship during an engineering degree is to motivate the engineering students and to equip them with the appropriate knowledge and skills which would enable them to launch and manage their entrepreneurship ventures. The teaching of entrepreneurship in engineering colleges will go a long way in broad basing the industrial base of the country. It has the potential to become a force for industrial development based on modern technology and for alleviating the problem of growing unemployment.

The studies conducted by National Science and Technology Management Information System (2003), of Department of Science
and Technology reveals a lofty migration rate from IITs and other premier technical education institutions. The basic problem lies with the kind of economic pricing strategies adopted in the country. Moreover on account of highly rigid structures and a general lack of autonomy in the working environmental lists, there exist very limited challenging opportunities for the young and dynamic talent being produced by engineering education system.

Kukreti et al. (2003) tells that engineering education has perennial significance to import progressive outlook to its citizens. It changes the perspective of human being by providing him a vast domain to choose between suitable job and self employment. In the present highly competitive age when the proportion of unemployed people is higher than ever. Technical education functions as the strongest weapon against this disturbing phenomenon.

According to Mohan (2004) Haryana state has several thousand strong work force of jobless engineers on the one hand and on the other 2000 seats in engineering colleges with no takers. The vacant seats pose a threat to the financial viability of private colleges. According to news the problem is two fold. One the degrees awarded by colleges hardly carried any value outside the state. Parents are in a fire. They spend lakhs of rupees on admitting their children to colleges but even after that the children continue to be dependent on them albeit with a worthless engineering degree.
Mahajan (2006) is of the view that due to lack of industrialization process in the state of Punjab highly skilled manpower engineers and technicians prefer to migrate to other the states.

Malhotra (2006) is of the view that electronics and communication engineering and computer science engineering are much sought after courses among the students. This study has been conducted in National Institute of Technology (NIT), Jalandhar. Due to the ongoing boom in telecom sector, communication and IT Industry has rate of campus placement [90% to 95%] and ever increasing pay packages offered by MNCs have been noticed. The craze for these courses has witnessed an upward trend during the past five years. The pay packages offered by major players like Infosys, Ericson, range between 2.5 lakh to 5 lakh per annum.

After reviewing the related research literature it has been found that various authors and researchers differ in their convictions and viewpoints about various aspects of growth and development of engineering and technological education in India.

It has been inferred, that there has been a phenomenal expansion in the field of engineering education but the unit cost has increased much and the quality of education in general has not been upto the mark. However IITs and other institutes of excellence are still providing qualitative education. Literature on social distribution of engineering education does not signify any positive trend towards
achieving the constitutional commitment. While, on one hand the increase in number of institutions suggests that opportunities of engineering education are expanding, but on the other hand proliferation of the privately managed, self-financed institutions restricts economically weaker sections of society from getting admission to these institutions because of very high rates of fees. It has been found in the review that number of women getting higher education is increasing but it is much below the rate of increase in total sanctioned intake.

Moreover, the review also suggests that financing of engineering education is also facing a number of problems. On one hand a large system of public engineering and technological education requires a huge amount of money to run it properly whereas on the other hand government is squeezing the grants for technical and higher education sector after adopting the new neo-liberal policies. Further, a huge number of trained engineers are unemployed due to inferior quality of training but many of them who get quality education usually migrate to the developed world. All these factors call for a detailed and in-depth study of the growth and development of engineering education in the country in general and the problems posed by the privatization and proliferation of engineering institutions in Punjab in specific.