CONTINUING ENGINEERING EDUCATION IN INDIA - AN OVERVIEW

* H.L. SALUJA

Synopsis :

The present paper to begin with attempts to establish the need for continuing engineering education as applied to technical and professional manpower development in view of changing needs of the society and the country at large. The various continuing engineering education programmes being conducted by different organisations in India have been discussed, highlighting their roles and responsibilities. The need for providing adequate opportunities for this form of education for working professionals in developing country like ours has been emphasised.

Introduction :

The economy of a country largely depends upon its natural resources and its capability to harness them. The capability in turn is a function of the proficiency level, adaptability and continuous updating of its technical manpower, amongst other things. In order to keep pace with the rapidly changing needs of the society and the country at large, the technical manpower must be continually educated/trained. No engineering education in the world can claim to teach students what all they need to know during their 'working life' later on. The requirement of continuing engineering education and training therefore becomes imperative.

Professor of Continuing Education, Centre for Continuing Education & Distance Learning, TTTI, Shamla Hills, Bhopal - 462 002 (India)

It is said - *'Engineering is a learning profession rather than a learned profession.'*

No engineering education is ever complete. An engineer/technician must continue to learn much beyond the period of formal education so that one is competent and confident to be able to contribute effectively in his profession. Different channels of continuing engineering education for serving professionals should therefore be made available and ample opportunity provided for this 'life long learning'.

Continuing Engineering Education Programmes in India :

To meet the requirements of continuing engineering education in India, programmes conducted by different organisations can be classified as follows :-

1. Government Sponsored Programmes :
   i. Technical Teacher Training (TTT) Programmes.
   ii. Quality Improvement Programmes (QIP)
   iii. Indian Society for Technical Education (ISTE) Programmes.
   iv. University Grants Commission (UGC) Programmes.

2. Professional Societies' Programmes
3. Employers' in-house Programmes.
4. Private Consultants' Programmes

1. Government Sponsored Programmes :

These programmes are fully financed by the Central Government and are meant for academicians / practising engineers and train both the pre-service and in-service personnel through different schemes. These are -

i. *Technical Teachers Training Programmes :*
The Government of India established in 1965, four Technical Teachers' Training Institutes (TTTI's) one in each region, to impart pre-service a/in-service training to teachers and staff of polytechnics in the country. The training programmes offered may range from short courses of about one week duration or even less to long term diploma/degree programmes of $1\frac{1}{2}$ year duration. Long term programmes such as B.Tech.

Ed. and M.Tech. Ed. are being run for technical teachers at TTTI Madras and TTTI Bhopal respectively. The training provided is in the areas of content updating, teaching methods, use of media, student assessment, educational technology and research etc.. The teachers are also exposed to the emerging technologies in the field of engineering / technology to keep them abreast of modern developments. Since the technical teachers spread the culture of engineering education in the country among future engineers, it is essential that the teachers themselves are continually updated. Technical Teacher's Training Institutes are doing yeoman service by providing integrated training in engineering content and pedagogy.

ii. Quality Improvement Programmes :

In order to enhance and strengthen the theoretical knowledge and practical skills of in-service teachers of technical institutions, long and short term quality improvement programmes are available. Engineers from other sectors may also participate in these programmes by paying prescribed fees. These programmes include formal qualification improvement programmes, short-term practical training and short courses of subject matter updating, curriculum and instructional material development etc.. A number of institutions are carrying out these activities under QIP. Prominent among these are the five IISc, Bangalore, University of Roorkee, Benares Hindu University, TTTIs and some selected Regional Engineering Colleges and Universities.

Under these quality improvement programmes, are also offered a $1\frac{1}{2}$ year Master's Degree Programme and a three year doctoral programme in different disciplines of engineering. The entry qualification for a Master Programme is a Bachelor's degree while for a doctoral programme is Master's degree in engineering. The participants of these long term programmes get contingency grants and monthly fellowships in addition to their normal salary from their employers. Every year about 200 teachers are admitted in the Master's programmes and

100 in the doctoral programmes.

Under the QIP are also organised short courses / workshops of one to two weeks duration in content updating, curriculum development and instructional material/preparation for the teachers of polytechnics and engineering colleges. The teachers of these institutions are also encouraged to undergo 3 months' practical training in reputed industries to reinforce their theoretical and practical knowledge. These training programmes are arranged around the summer vacation when then teachers are comparatively free from academic load. They are also paid a monthly stipend to meet transport and out-of-pocket expenses. About 300 engineering college teachers and 600 polytechnic teachers are taking the benefit of these programmes annually.

iii. *The Indian Society for Technical Education (ISTE) Programmes:* ISTE was set up in 1968 to further the cause f technical and technician education in the country. It is fully financed through the Ministry of Human Resource Development, Department of Education and Culture with its offices in the IIT Campus, Delhi. It provides financial support for organising short term programmes workshops, seminars and conferences to such engineering colleges/polytechnics/technical teachers training institutes as wish to conduct summer/winter schools (1 to 4 weeks' duration) for teachers of engineering institutions on an all India basis. Participation of engineers from industries is also permitted in these programmes to the extent of 20% of the total participants. The subject areas covered in these courses are content updating in engineering education, teaching methodology, curriculum development, instructional material preparation, educational management and exposure to advancements in emerging technologies. Thousands of technical teachers have benefited from these continuing engineering education programmes sponsored by the ISTE. A monthly 'News Letter' and a half-yearly 'Indian Journal for Technical Education' are also published under its aegis.

Continuing Engineering Education for Working Professionals :

To give impetus to continuing engineering education of working professionals, the Government of India, Ministry of Human Resource Development in pursuance of 'New Education Policy (1986)' and 'Programme of Actions' initiated a project in the year 1988. The project aims at updating / upgrading the knowledge and skills of professionals/vocationals working in industry and allied organisations. This is intended to be achieved by conducting short and long term courses and designing and developing relevant and useful course material. The course material may be prepared for different levels. *viz.* artisans, supervisors or engineers depending upon the target population. A snap survey was conducted early last year to identify the areas in which there is a need for such continuing education programmes. A number of reputed industries both in the public and private sectors were contacted and a list of titles for continuing education courses was finalised. The Government of India, Ministry of Human Resource Development has entrusted the task of preparing the continuing education course materials to ten institutions in the country, *viz.* - four TTTI's Five IIT's and the ISTE itself. The ISTE is also co-ordinating and monitoring the Continuing Education Project at the national level which is being funded by the Central Government.

Need based course material is being prepared at the above mentioned 10 resource centres. This material will be supplied to such organisations and institutions, engineering colleges/polytechnics as would like to run continuing engineering education courses for different levels. of technical manpower in industries on a self-supporting basis. A modest but systematic beginning in the field of continuing engineering education for working professional has thus been made. Long term continuing education programmes leading to the award of diploma/degree are also being conducted for working professionals by selected institutions through contact/distance mode. To suit their convenience, classes in the mornings/evenings and at the week ends are arranged subject to institutional constraints. Government Polytechnic for Distance Learning Pune is one such institute running diploma courses in engineering through correspondence mode. A large number of professionals are expected to benefit from these programmes.

iv. University Grants Commission's Programmes :

The Government of India set-up, by a resolution in 1952, an interim University Grants Commission, which started functioning since the 28th of December, 1953. The commission was set-up to advise the Government on the "allocation of grants-in-aid from public funds to the central universities and other universities and institutions of higher learning whose case for such grants may be referred to the commission by the Government and to advise the universities and other institutions of higher learning on any question referred to the commission by the Government.

As per the Constitution of India, which came into effect in 1950, education is mainly a "State Subject" - the Centres is responsible for technical education and for co-ordination of higher education and maintenance of standards. The UGC derives its powers from the Central Government and as far as state universities are concerned, its functions are limited to helping in their development. The UGC has to work in close co-operation with state governments.

The UGC by providing grants to universities and institutions of higher learning has helped to develop "Centres for Advanced Study" and "Centres of Post-Graduate Studies." in the pursuit of academic excellence in these institutions. Through a system of summer institutes, workshops, seminars, refresher courses and symposia, the commission has sought to enable teachers, students and others to keep abreast of advancements in engineering and non-engineering areas. The UGC also provides small but useful grants to teachers for research work and specialised study; grants are also given for publication of learned work, academic travel and continuing engineering education courses conducted by the academic institutions, affiliated to the universities.

The UGC has, of late, started sponsoring educational television programmes on engineering, science and technology and other related subjects on a national TV network. These

programmes are telecast from 12-45 pm to 1-45 pm and repeated from 4 pm to 5 pm the same day. A culture of "National Class-room" has thus been created for the promotion of engineering education, in the country.

2. Professional Societies' Programmes :

For imparting continuing engineering education to the members and others, a large number of professional societies run part-time, correspondence and /or special programmes in various disciplines of engineering on a regular basis. The largest and the most prestigious among these is the Institution of Engineers (India) with head office at Calcutta, and its various chapters located in moderately large cities in India. The Institution conducts engineering examinations for Diploma holders and Science Intermediates/graduates. A pass in sections A, B and C of Institution of Engineers examination is considered equivalent to a Degree in Engineering. The pass-outs are conferred a Graduate Membership of Institution of Engineers (AMIE) and can go for post-graduate studies in engineering or seek employment for posts where degree in engineering is the prescribed qualification. Thousands of diploma holders/intermediates/Science graduates take these examinations every year. The degrees awarded are recognised by the Government of India for purposes of employment and further studies.

A large number of other professional societies / bodies which organise seminars/workshops/short courses in the field of engineering and management for teachers/technicians/practicing engineers are the Institution of Industrial Engineering, Institution of Electronics and Telecommunication Engineers, Computer Society of India, National Productivity Council (NPC), Indian Society for Training and Development etc.. Some of these professional societies conduct examinations for practicing engineers and technicians and award them certificates. Almost all of them publish their own news-letters/journals so as to expose their members to changing/new technologies in the professional fields. They are thus contributing informally to the continuance and promotion of engineering education in their own ways.

3. Employer's Inhouse Programmes :

Many industrial houses, public and private sector undertakings and

employers of small, medium and large scale industries conduct in-house programmes for their employees utilising expertise available within and outside the organisation. Many of them have a separate training division for this purpose. These employers have their training programmes designed to suit their specific requirements. Apprentices and technical manpower of small industries are also trained by the big industries of a similar nature as the latter have adequate infrastructural facilities and manpower available with them. Bharat Heavy Electricals (India) Ltd., is one such organisation looking after the continuing engineering needs of its employees and sister concerns.

4. Private Consultants' Programmes :

Consultants in the private sector conduct/arrange engineering education/training programmes for their clients on payment. Professionals working in academic and research institutions and practising engineers and technicians can take advantage of these. But normally their charges are very high - thus limiting their clientele.

Present Status and Future Trends :

In a developing country like India, the needs keep on changing with the growth and effective use of natural resources and advances in technologies. It is therefore necessary to have well through-out programmes of continuing education both short term (3 to 5 days) and long term (1 to 6 weeks). Short term programmes may comprise of seminars, symposia, conferences and workshops involving presentation of latest information followed by discussions. Long term programmes may comprise of refresher courses where regular programme of lectures, practical and tutorials can be arranged with group discussions on practical problems forming its composite part. Short duration programmes are favoured by busy field engineers whose employers are reluctant to spare them for longer duration. The academicians can benefit both from long and short term programmes.

Surveying the continuing education programmes in India, Ranganath M.V. (1981) observed that the activity level (defined as the number of courses for the continuing education of engineers per year per one million habitants) is only 0.3 for India compared to 2.4 for Brazil and 32 for USA. there is, therefore, a large gap between the continuing

education programmes available and the continuing education programmes required for the engineering manpower in different sectors.

It is , therefore, of paramount importance to have adequate need based and well organised continuing engineering education programmes for our serving professionals who have to meet challenges posed by emerging technologies of the present and the future. In this context it is envisaged that -

i. An All India Board of Continuing Engineering Education be set up under AICTE at the national level like All India Boards of Vocational Education and Technician Education etc.

ii. Centres for continuing engineering education be established within the States in the Universities/State Boards of Technical Education.

iii. Continuing engineering education departments be established in selected engineering colleges/polytechnics.

iv. Centre for Continuing Engineering Education set-up in all the IIT's and TTTI's be strengthened.

While the All India Board of Continuing Engineering Education will take care of the planning, policy formulation, implementing and monitoring of continuing education programmes, the centres for continuing education at the State level will provide necessary information to the continuing education departments regarding the nature of the programmes to be offered considering the needs of the user system. These centres will have linkages with National Board of Continuing Education, industries in the organised / unorganised sectors, TTTIs and IITs and continuing education departments in engineering colleges/polytechnics. These departments will offer continuing education programmes (formal and non-formal) for the user system through contact and/or distance mode. These programmes will also have close linkages with TTTIs, IITs, Indira Gandhi National Open University and other resource institutes which have been entrusted with the responsibility of producing and disseminating course materials for implementing the continuing education programmes.

Conclusion :

It is hoped that a sound system of providing continuing engineering education to our work-force will develop if adequate inputs in terms of physical, financial and human resources are pumped into it. It is an uphill task and all concerned must endeavour to work in this direction in right earnest, in order to achieve worthwhile results.

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